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New Advertisements.

In the growth of THE ELECTRICAL WORLD in circulation, size and general improvement, the value of its columns for reaching those engaged in electrical pursuits or interested in electrical matters has not failed to be appreciated by advertisers. Readers will find it to their advantage to keep their eyes on the advertising as well as the reading columns. The following are the new advertisements in this issue:

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Vol. IX. NEW YORK, MAY 21, 1887. No. 21.

THE American Institute of Electrical Engineers, after talking about a home for three years, has at last made up its mind to get one; and, as an earnest of its resolve, it raised over $1,600 in ten minutes at the meeting on Wednesday last. Now the good work will go on, and electricians will soon have permanent headquarters in this city, such as those so highly appreciated by the civil engineers, whose hospitality they have been enjoying. The plan comprehends all that is required in such a building, and if the feeling shown at the meeting pervades the whole fraternity, there is not the least doubt that the Institute can enter on occupation in the Fall, as well started, on the second stage of its career of usefulness, as any like body at home or abroad.

A MOST interesting contribution to the history of the secondary generator is the letter of Mr. Alex. Bernstein, in which he quotes the text of an application for a patent filed by him in the U. S. Patent Office in 1883. It will be remembered that he referred to this application in a recent letter.

IT is evident from our items under the head of "Applications of Power," that the number of street railways intending to adopt electricity as their motive power is weekly—almost daily—on the increase. Already the electric roads running are carrying passengers at the rate of 3½ millions annually, and the figure will be easily more than doubled before the close of 1887.

MR. J. HARRIS ROGERS, of Pan-Electric fame, is now bringing to notice, say the Washington dispatches, a system of "visual synchronism," which, if all be true that is claimed for it, is an undeniably great invention. If Mr. Rogers will bring it forward in such shape that it can be tested, he need not fear that his former misfortunes, in the Pan-Electric alliance, will weigh against him with electricians or the public. As he himself says, what he wants is "honest business men."

THE plan adopted on the Wabash Railroad system of requiring every conductor, engineer and flagman to protect his watch by an "anti-magnetic shield" is certainly a very wise one. The spreading use of electric machinery, embodying powerful magnets, leaves little doubt that one of the fruitful causes of the irregular action in watches can be found in their being magnetized. If the provision of an iron shield is sufficient to avoid this danger, railroad companies will find it a good investment to furnish their employés with them free, and thus by a small outlay avoid accidents which may involve the loss of many human lives and thousands of dollars.

THE fight for the electric lighting contracts in New York City has been growing hotter and hotter, until at last it looks as though the award must bring loss to the parties winning it, because of the onerous terms accepted. This would, indeed, be a matter of regret. A good arc light on the streets anywhere is worth a fair price, and no permanent benefit can accrue to any one in the long run from rates cut below a living price. Moreover, the example of New York in such matters is one that other cities are apt to follow. One plan to adopt might be that the companies all agree on a fair bottom price they will ask, and then that they bid freely inside that figure.

IN this issue appears the second of the series of papers on the electrical industries of Mexico. It is believed that much of the information there given will be new even to electric lighting men, whom it chiefly concerns. The conditions in Mexico are, it is evident, not extremely favorable to the development of electric light and power, and yet, such is the influence of American energy and enterprise, they compare well with some that are to be found in European countries of even the first class. The suggestions touching the greater use of the water power in Mexico have their special pertinency in view of the activity now being manifested generally in the electrical transmission of power.

MANY harsh things have been said against the telephone, but now we hear of something actually dangerous in connection with its use. The promiscuous use of the "telephone mouth-piece" is said to be a means of spreading infectious diseases. This piece of news will hardly cause alarm here, where telephone mouth-pieces are not used so very promiscuously. The observation noted evidently comes from abroad, where a tube having a mouth-piece attached ends at the transmitter. Here we talk directly into the transmitter. Direct contact with it is rarely, if ever, necessary. When it is, it will be time for the instrument to be inspected.

WRITING this week in relation to an article which appeared in our last issue, Mr. E. R. Knowles corroborates the experience which dictates the use of a lightning conductor on only one side of an electric light circuit, but he sees in it a danger arising from the current taking the other, more circuitous, path through the dynamo in order to get to ground, and he suggests a remedy therefor. It may be interesting to recall here that one way of extinguishing the arc formed between the points of a lightning arrester consists in the employment of a magnet to blow out the arc. This and other automatic devices for the same purpose have already been described in our columns.

ELECTRIC railroading is not yet so old an art that new things in connection with it are scanty or slow in developing. On the contrary, we know of no field which presents larger opportunities for inventive genius than this one, nor one in which the questions of locality and expediency are greater factors. The system described and illustrated on another page, though not new to us in principle, is a decidedly interesting, and, to the public, novel method of effecting contact with a conductor practically insulated throughout its length. By making the surface conductor spanned by the car "live" only during the passage of the latter, and employing magnets to effect contacts below the surface, the question of insulation seems to be well taken care of. It also avoids some other knotty questions which arise in city railroading. It now only remains to be seen whether these magnetic contact devices can be depended on for continuous service, and of this there ought to be no serious question. We happen to know that several inventors in this country have been at work for some time on the very idea that is presented in this system, but they have not yet given publicity to the fact. No doubt they will soon be heard from.

THE present condition and future prospects of electric lighting in Mexico, which are described in another column, bring out several curious points showing that in some localities electric lighting seems to be particularly favored. Thus it has been observed that in the high altitude of the City of Mexico an arc dynamo, run at the same number of revolutions as at the sea level, will generate a stronger current in the former place. We may look for an explanation of this phenomenon in the fact that the diminished air pressure reduces the resistance of the arc and, thus, with the same potentials at the terminals of the dynamo, an increased current is generated, which, as is shown, has on more than one occasion caused the destruction of the dynamo. It would seem, therefore, that an arc dynamo as well as the lamp, requires adjustment for barometric pressure. From what has just been said it follows that the higher the altitude, or the lower the air pressure, the less would be the energy required to operate arc lamps. This brings us back to the idea of the original arc lamp of Sir Humphrey Davy, in which the charcoal pencils were placed in a vacuum. In this case, however, the object was not to decrease the resistance, but to prevent the rapid combustion of the pencils.

ONE of the most absorbing questions of the day seems to be the finding of a correct definition for the word "invention." Its general meaning is well enough understood but its meaning in law seems still to be in a state of doubt. In proof of this the article by Mr. W. C. Barney, containing a variety of opinions delivered by the courts, is pertinent. Mr. Barney argues that the publication of an early description of an apparatus designed to act as a telephone is such as to make void the rights to patentability of the modern instrument. He concedes that Bourseul never made a telephone, but yet he holds that the description given is sufficient to enable a workman to construct a speaking telephone. The question to be decided is whether, as in this case, a speculative apparatus, as it were, shall be a bar to the value of an instrument which actually accomplishes the work for which it is designed. We think that a line must necessarily be drawn between the two. Leaving the particular case in question entirely out of consideration, it would seem that if this "priority" were to be held binding, invention must soon come to a standstill for want of encouragement, as the imagination of man is such that there is hardly any object to be attained that cannot be solved in a speculative way. True invention means the reduction to actual practice of principles, ideas and the works of the imagination. The latter alone would never give us anything, though probably, in some respects, of as great a value to the furtherance of the object sought as is the actual practice.

THE American Institute of Electrical Engineers has, on entering upon its fourth year, taken a very important step in its resolve to secure a home—permanent quarters where its meetings can be held, its friends received, experiments made and apparatus displayed, a museum established and a library formed. The Institute is growing so rapidly in membership that it could not take more opportune action, one that will benefit itself and promote the lasting welfare of the great science and industry of electricity. The members have already done much in the last few days to show their enthusiasm on this subject, and there is no doubt that the wealthy companies and the leading capitalists and inventors whose names are so honorably associated with electrical applications will assist the movement generously and liberally. The Institute has been talking over this matter for three years, during which time it has enjoyed the hospitality of the American Society of Civil Engineers. It now feels, however, that it is time to be no longer in the position of a guest, but to secure a home worthy the magnitude of the interests it represents. There is no movement that we could more heartily commend to our readers for their support and encouragement. They will recognize its claim on the higher grounds, but it is not wrong to point out that such a movement must everywhere create a feeling of pride in connection with the science and its application, and assure capital that electrical work is firmly built on an enduring basis of technical skill and knowledge, and has in it overwhelming promise of permanent prosperity. We shall be glad to receive and record any contributions to the House Fund. It is a fact to be borne in mind that the fine house of the civil engineers was obtained through the liberality of members of the profession and its friends.

The Electrical Industries of Mexico.

BY W. J. JOHNSTON.

2.—*Electric Lighting.*

Just imagine, if you can, the authorities of such a city as Cincinnati, or New Orleans, or San Francisco, giving the exclusive right of running electric light wires through its streets to one company, and then stretch your imagination a little further and think of the company enjoying such exclusive privilege saying, in answer to a request for an electric light in front of a business house, that its utmost capacity is only 118 lights, all of which are taken by the city, so that if you want an electric lamp in front of your store, you must either put in a private plant or else wait until some arrangement is made by which the company having the exclusive right of running wires through the city for electric lighting purposes can increase its plant sufficiently to furnish lights to the public!

That is precisely the condition of affairs to-day in the City of Mexico, the capital of the Republic, and a city with a larger population than either Cincinnati, New Orleans or San Francisco.

So far as I was able to learn, the electric light was introduced into Mexico for the first time in 1877. The pioneer plant was brought from France in that year, and was installed in a small cotton factory in the little village of San Angel, about seven miles from the City of Mexico. It was put in as an exhibition plant, with the expectation of getting the City of Mexico to adopt the system. Owing, however, to defects either in the management or the system the experiment proved a failure. The dynamo refused to work on the third night of the exhibition, and has never, they tell me, run since. It now languishes under a collection of old mill iron and cobwebs.

The Brush appears to have been the first American company that made an attempt to introduce an electric light system in Mexico. A representative of that company went down there about 1880, and two years later made an arrangement with the Mexican Gas Light Company for the control of the Brush system throughout the Republic of Mexico.

In 1885 an arc and incandescent plant of the Weston (United States) system was sold to the city of Guadalajara. There is no railroad to Guadalajara, and the apparatus had to be carried on the backs of mules, over the mountains, for a distance of 150 miles.

This was the beginning of electric lighting in Mexico. Of late years American companies have been giving more attention to supplying any demand there may be for electric lights in the land of the Aztecs; and at the present time most of the principal companies have representatives, in the City of Mexico, at least, and the competition for business among these representatives is exceedingly brisk.

About a year ago the city of Puebla asked for estimates for illuminating its streets by the electric light, and an agreement was entered into between the city and an Englishman for a plant of one hundred lights. The contract was drawn up by the city authorities, and they did not seem to think that there was any practical difference in the systems, for there was no particular system named in the contract. The work was not proceeded with in time to permit of having the plant installed at the date required by the contract. This, it is said, was due to a lack of funds on the part of the contractor. A new arrangement was made, however, which gave him until the 15th of March, of the present year, to carry out the scheme; but, still owing, it is said, to lack of funds, the apparatus did not arrive until some time after the 15th of March. In the meantime, the representatives of a leading American company, who had had their eye on Puebla, made an exhibit of their system to the Puebla government and succeeded in getting the old contract annulled on the 15th of March, when it was apparent that the other contractor could not install the plant on time. Not only did they get the old contract annulled, but they obtained a new one in their own favor for 125 two thousand c. p. lights to be run by water power supplied by the falls of the Atoyec River, 8 miles from Puebla.

According to the estimates made, there will be a very considerable saving by the use of water power. Coal is so expensive in Mexico that if this were used, the cost of the 125 lights would be about twenty thousand dollars a year, whereas, by the use of water power the expense is only two thousand dollars. The water-wheel to be used is manufactured by the Stilwell & Bierce Manufacturing Company, of Dayton, O.

I spoke about the City of Mexico at the beginning of this article. The company that has the exclusive right of running electric light wires in the City of Mexico is an English one, known by the name of the Mexican Gas Light Company. It has two sixty-light Brush machines, and supplies, as I intimated above, 118 lights—all of them to the city. Mr. S. B. Knight, the manager of the company, has lived in Mexico for a long time, and does not appear to have as much faith in the future of electric lighting in Mexico as have American electricians who go down there. Mr. Knight says that the company has a contract with the city for a considerably larger number of lights than are now running; that the finances of the city are so low that the company has been asked to carry out, for the present, only a part of the contract, and that to do this taxes the present capacity of the company to the utmost. The plant, says Mr. Knight, is to be extended to 600 lights of two thousand c. p. each, in addition to ten towers of 16,000 c. p. each. "Just as soon," he adds, "as the city tells us to go ahead, we will at once put in the necessary apparatus, not only for the extra lights required by the city, but also for what will probably be needed by the public."

From the above it can be readily seen that the condition of electric lighting in the City of Mexico can hardly be called satisfactory; for, as I mentioned above, business houses who wish electric lights are unable to get them unless they go to the expense of a private plant. I was led to understand, however, that this state of affairs will probably not last very much longer, as a strong effort is on foot to induce the city authorities to revoke the exclusive concession given to the Mexican Gas Light Company, and transfer it to a company that will guarantee to furnish all the lights that may be needed, either by the city or by the public.

There are several curious things about the City of Mexico which will interest electricians. The altitude is so high—7,000 feet—that an arc dynamo that is ordinarily intended to run at a speed of a thousand revolutions will furnish one-third more current in the City of Mexico than it would, say, at Vera Cruz, with the brushes in the same relative position. The consequence of this has been that, through carelessness, a large number of armatures have been burned out in the City of Mexico.

The air of the City of Mexico also exerts a remarkable effect upon gas. The high altitude seems to make the gas sluggish; and it requires a much larger pipe and more pressure to force the gas required in that city than in any place at the level of the sea. In fact, gas that would have an illuminating power of 100 at Vera Cruz, would under the same conditions have only an illuminating power of 70 at the City of Mexico.

I like to see circumstances of this kind taken advantage of and turned to practical account, and it looks to me as if this is an important point in favor of the incandescent light. Mr. Knight told me that it was the intention of his company to introduce incandescent lights and give customers the choice of either gas or electric lights, just as they preferred.

As I stated in the last article, coal costs $22 a ton in the City of Mexico, and gas is made from wood which costs $14 a cord. The price of gas to the city is $5.50 a thousand and to private consumers $7.50.

There are three factories in Mexico lighted by the Brush system—two in the City of Mexico and one on the road to Vera Cruz. There are 45 1,200 c. p. lights in one of these, 30 1,200 c. p. lights in another and 16 2,000 c. p. lights in the third. Vera Cruz has a plant of two 16-light Brush dynamos and supplies 32 lights.

Messrs. J. Arce & Co., of the City of Mexico, are very energetic in their efforts to introduce the Thomson-Houston system in Mexico, and are meeting with considerable success. Mr. A. W. Fuller, a graduate of the Thomson-Houston factory at Lynn, Mass., has charge of the electric light department of Arce & Co. There are 300 Thomson-Houston arc lights at Guatemala; and also a plant of nine 1,200 c. p. lights of the same system has been put in the shops and yards of the Street Railroad Co. of the City of Mexico.

The Mexican Central Railway Company has a Weston machine in use in the City of Mexico, furnishing 8 arc and a number of incandescent lights.

The Edison Company is represented in the City of Mexico by a Mr. Guerrea, a Mexican.

There is considerable inquiry about electric lights from Zacatecas, Toluca, Pachuca, and several other Mexican cities. The National and Principal Theatres in the City of Mexico, and also the National School of Sciences and Hotel Iturbide in the same city are talking of putting in electric light plants. The Iturbide is to have a steam elevator (the first one in Mexico), a 16-light dynamo to supply seven arc lights of 2,000 c. p. each, and the rest in individual cut-out lamps. A Ball engine is to be used.

I was told that Mexican capitalists are very shy of American machinery agents, on account of having been swindled unmercifully by them in times past, and this, of course, has its effect in the way of retarding the progress of electric lighting. I am afraid, moreover, that perhaps in every case the men who first went to Mexico for the purpose of introducing the electric light were not such as to inspire confidence in the Mexicans. The Americans with whom I talked, however, were all unanimously of the opinion that the condition of business in Mexico is improving, and that there is a good future for electrical appliances.

To understand Mexico, and to appreciate just how much of a field it offers for the introduction of electrical machinery from America, it must be borne in mind that the Mexicans themselves are not progressive. I am inclined to think that there will be considerable progress in that country during the next quarter of a century; but whatever is done in that direction must be done almost entirely by foreigners, and in spite of the opposition of the Mexicans. Foreign capital does much more in the way of improvements down that way than native. As a matter of fact, I was told that all the principal prominent business houses in Mexico are owned by foreigners. These foreigners for the most part are German and French, though there are quite a number of Spaniards in trade The feeling between Mexicans and Americans is not as cordial as I would like to have seen it. My observations led me to conclude that one reason for this was that the Germans and French aforesaid, who may be said to have the trade of the City of Mexico in their hands, are inclined to throw as many obstacles as possible in the way of the Mexicans and Americans entering into as close business relations as the proximity of the two countries would seem to make it to their mutual interest to do. It may be that the French and Germans are of the opinion that should Americans get a foothold in Mexico they will be there to stay, and that it is, therefore, to their advantage to foster the absurd idea which some Mexicans seem to have, that the United States is anxious to go down there and take Mexico some day by conquest.

It did not strike me that there is very much of a field in Mexico for electric lighting outside of the cities and larger towns. There are very few factories in the Republic. What work of that kind is done in most lines of manufacture is performed by the men and their families at home, and this, of course, is the reason that one sees so few factories in Mexico. It was thought at one time that quite a number of electric lights could be supplied to the cotton factories, but these have recently decided to run day times only, and keep open longer, instead of working into the night and having shorter seasons. I hardly think there is an electric motor in the Republic, and I do not imagine that there will yet be use down there for many.

Annual Meeting of the American Institute of Electrical Engineers.

In accordance with announcement, the American Institute of Electrical Engineers held its annual and general meetings, in this city, on the 17th and 18th inst. Preceding the annual business meeting on the 17th, the Institute accepted an invitation from Mr. Erastus Wiman to inspect the telemeter system indicating and recording temperatures by electricity in the warehouses of the Brooklyn Bridge Freezing and Cold Storage Company, at Franklin Square. About 250 gentlemen were present, including nearly all the prominent men connected with New York's electrical interests. Much pleasure was experienced in inspecting the plant and in discussing the collation.

After leaving the rooms where the reception had been at once so cold and so warm, the Institute visited by invitation the cable and electric lighting plant of the Bridge.

The business meeting was held at 8 P. M., at the house of the American Society of Civil Engineers, 127 East Twenty-third street, President F. L. Pope in the chair. The secretary's report gave evidence of a rapid increase in membership, and of a healthy condition of the finances. The officers were then chosen for the year, and the full list, with those remaining in office, is as follows: President, T. C. Martin; Vice-Presidents, Dr. Norvin Green, Prof. W. A. Anthony, George C. Maynard, Frank L. Pope, Rowland R. Hazard, Prof. Elihu Thomson; Managers, Sidney F. Shelbourne, Capt. O. E. Michaelis, Prof. Cyrus F Brackett, C. O. Mailloux, Charles L. Buckingham, David Brooks, Schuyler S. Wheeler, Joseph Wetzler, A. C. Fowler, William Lee Church and E. P. Thompson; Sec., Ralph W. Pope; Treas., George M. Phelps.

At the meeting on Wednesday, when the attendance throughout was large, the following papers were read and discussed: Prof. Elihu Thomson, of Lynn, Mass., on Novel Phenomena of Alternating Currents; by E. P. Roberts, of Cheyenne, Wyo., on Practical Experience with Storage Batteries; by J. A. Powers, of Troy, on the Construction and Equipment of Central Station Lighting Plants; by Prof. W. A. Anthony, of Cornell University, on the Differing Temperature Coefficients of the Different Coils of a fine Rheostat; also on the Change from Negative to Positive of the Temperature Coefficients of some Carbon Filaments; by Dugald C. Jackson, of Cornell University, on the Best Ratio of the Section of the Gramme Armature to the Section of the Field Magnets; and by T. C. Martin, of New York, on a few Comparative Statistics of Electric Railways.

At the opening of the afternoon session, Mr. G. M. Phelps reported as chairman of the committee to consider the project of securing a home. The report was strongly in favor of immediate action, as the Institute had been discussing the matter for three years, and it recommended that the Institute proceed to raise at least $10,000 by subscription now, and as much more as possible, with the object of at once securing a house to cost about $30,000, where the Institute could install itself and place safely all the books, instruments, mementoes, documents, etc., that are already accumulating. The report was received with the most manifest enthusiasm, and in less than ten minutes over $1,600 was pledged, among the contributors being J. F. Morrison, Pope, Edgecomb & Terry, W. J. Johnston, S. S. Wheeler, Prof. Elihu Thomson, G. M. Phelps, Jr., Capt. Michaelis, Prof. Anthony. A list of the contributors will be published forthwith in the electrical journals, and will be supplemented from time to time as the movement spreads. Several leading electricians and friends of the Institute have already signified their intention of giving largely and liberally to the fund for an end so laudable and beneficial.

The Institute adjourned a little after five P. M.

Pollak and Binswanger's Electric Railway System.

Notwithstanding the variety of methods and devices employed in transmitting the current from the central station to the motor on the car, there are still new ones to make their appearance. Among the most recent of these is the system of Messrs. Pollak and Binswanger, described in *La Lumière Electrique*, and the chief point of novelty of which consists in the ingenious method adopted for transferring the current from an insulated conductor to the motor on the car.

M. Pollak uses the rails as the first conductor, but the second conductor is completely insulated under the road, and does not communicate directly with the exterior. The current enters the car by means of a third rail placed in the middle of the track. Fig. 1 shows this arrangement in longitudinal section, and Fig. 2 in transverse section. This rail, which should be made of soft iron, is divided into segments of about 3 to 4 metres in length, insulated from each other electrically by means of wood and fibre. Each segment is formed of two parallel bands of iron, *R*, separated by a non-magnetic body, such as wood (Fig. 3).

Ordinarily these segments do not communicate with the insulated conductor; each of them is fitted with two metallic boxes *K*, Fig. 4, firmly fixed below, and into which penetrate the branches of the principal conductor. These branches abut on pieces of soft iron *n*, terminated by a piece *m*, also of iron, jointed to the former, and connected with it besides by the spring *r*.

The car is fitted with a powerful magnet, *N S*, Figs. 1 and 2, the poles of which magnetize by induction the two segments of the rail. These then attract the piece of iron *m*, which closes a contact, bringing the segments into communication with the principal conductor. Consequently, at this moment the brushes resting on the central rail can collect the current. When the car has passed, the segments are demagnetized, the iron contacts fall back, and the communication between the segment and the principal conductor is broken.

The boxes *K*, in which these contacts are made, are closed hermetically and half filled with petroleum, which prevents moisture from gathering on the different parts.

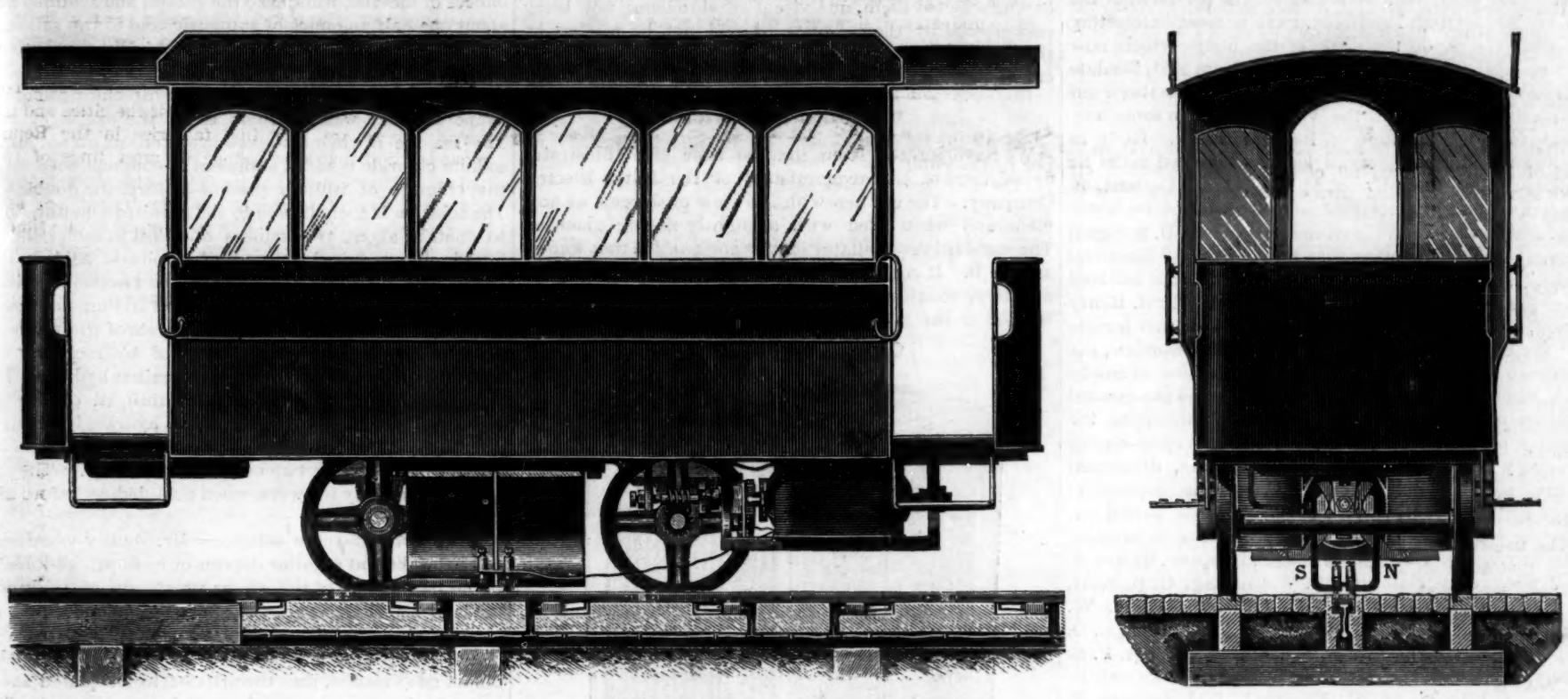
The insulation of the boxes may be rendered practically perfect, so that losses from faulty insulation can take place only between the central segments placed beneath the car and the extreme rails on the surface of the earth. The loss, being limited to so trifling a length, is insignificant. The cost of laying the line is not high in comparison with the systems having underground channels; the central conductor being well insulated, there is no occasion to make a drain or to interfere with the road. The chances of deterioration are claimed to be very slight, as no delicate part is exposed. The car always covers the segments which communicate with the underground conductor, so that there is neither danger of short-circuiting nor of giving shocks to men or horses traversing the road.

The system permits of the use of high potentials, and consequently effects a great reduction in the loss in the conductors. In fact, with a difference of potential of 500 volts 6 ampères suffice to furnish four electric horse-power, which is more than enough for propelling a car under ordinary conditions.

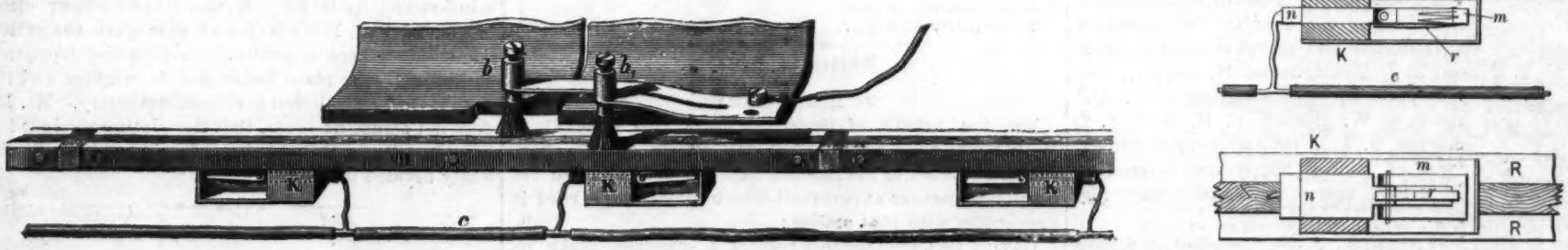
The different figures accompanying the text refer to the reduced model of this tramway as it has been presented to and worked before the International Society of Electricians.

Instead of bringing the current by the central rail, and letting it return by the two others, it will often be advantageous to make use only of two rails properly so called. One of them is divided into segments, like the central rail just described, while the other remains as it was. In this case the wheels placed on one side of the car have to be insulated from their axles. The central rail is especially advantageous when it is required to convert a line already existing.

In order to employ gear wheels the inventor makes use of slow speed motors which revolve only about 500 times per minute, so that a single transmission by a cog wheel is sufficient to transmit the rotation from the dynamo to the wheels of the car, which at their normal speed make from 100 to 120 turns per minute (16 kilometres per hour with wheels of a diameter of 4-5 metre). The illustration, Fig. 1, made from a model, however, shows a worm gear employed as the means of transmission.



FIGS. 1 AND 3.—POLLAK AND BINSWANGER'S ELECTRIC RAILWAY.



FIGS. 2 AND 4.—POLLAK AND BINSWANGER'S ELECTRIC RAILWAY.

Danger to Dynamos from Lightning.

BY E. R. KNOWLES.

I notice in THE ELECTRICAL WORLD of the 14th inst. quite an interesting article on the action of lightning on electric light conductors, etc. I observe that Mr. Wood has discarded, and very properly too, the use of two lightning arresters, one for each arm of the circuit, and uses only one lightning arrester, attached to the incoming or negative wire. This is certainly safer than the other arrangement, but there is no special novelty about this arrangement, it being the ordinary way of applying an arrester for such purposes, and in common use everywhere. I am of opinion, however, from my own experience, that even this arrangement with one arrester is faulty also. What is going to happen to the dynamos if the lightning stroke happens to pass around the circuit the other way, and instead of going to ground through the arrester, as desired, passes through the dynamo before going to ground? It may be said that this will not happen, but it does happen all the same, and I have lost armatures from this very cause. There is only one absolutely safe way, and that is to so arrange the arrester as to automatically break the main circuit and throw it to ground in case of a lightning stroke, and this should be done on both arms of the circuit.

What is Electricity?

BY N. H. EDGERTON.

I wish to thank Professor Dolbear for his admirable illustration of the twisting rope, which will assist many to a better comprehension of the train of molecular vibrations, which we denominate electrical current, than they have ever had before, as well as for objecting to the reception of a theory which can only confuse and mislead.

The science had in its early days the "one fluid theory" and the "two fluid theory," comparable to the measles and chicken-pox of childhood. But, having gotten safely over these, in Heaven's name do not let us go backward and cover with a mantle of confusion and error the origin and operation of the most sublimely simple of all the great forces of nature by declaring it "matter." By so doing we should place ourselves on a par with the young man who, when he saw the electric light for the first time, was so carried away by his enthusiasm for it that he importuned the writer to furnish it to him at his house, saying: "I'll have my house lighted with *that stuff* if it costs *twenty dollars a barrel*."

If Prof. Dolbear will permit me I would suggest that "the difficulty of getting a mechanical idea of electricity" would be greatly lessened by taking into consideration the origin and directive tendency of the chain of vibrations which we call current, and to do this we must get at the cause of those vibrations. Let us take for our example a simple galvanic cell.

We shall find the surface of the oxidizing electrode to be the base of operation or the starting point in the circuit, and the cause of its so being is that we have enveloped it with a substance which offers to every molecule on the exposed surface of the plate a stronger attraction than that which holds it in the metallic form. With a spring it passes into the saline state, setting up the crest of the first wave or vibration in the chain, and exposing its immediately consequent neighbor atom to the same attraction to which it succumbed. Thus follows an infinite number of vibrations or oscillations, each crest pointing outward from the oxidizing electrode most probably because the rear of each molecule is protected by the mass in the plate, and the solicitation to change of condition comes from one side only. In this view of the case duality disappears and we have a conception of a continuous vibratory chain of molecules to which the Professor's twisting rope is a complete analogy.

In short, electricity is *the energy of molecular vibration*, and the cause of electricity is *any disturbance* of the *normal attraction* of *matter*, but not matter *per se*.

Celebration of the One Hundredth Meeting of the New York Electrical Society.

A dinner in celebration of the one hundredth meeting of the New York Electrical Society, the electrical section of the American Institute, was given on May 11 at the D'Orville restaurant, in the Mills Building. Mr. D'Orville, himself an old telegraph man, did all in his power to promote the success of the dinner, which, though quiet and dignified, as became so old a scientific body, went off with the utmost éclat. A special menu was prepared for the occasion, printed in electric blue of two tints on a white ground, with devices representing the electric light, the telephone and the telegraph, the two cards used being tied at the top with red telephone cord.

After the cloth had been cleared, the president of the society, Mr. John M. Pendleton, gave a most interesting historical sketch of the work of the body—which now has a membership not far short of 200—from 1881, the date of its formation, down to the present time, and he threw out the pertinent hint that the society should in some way provide for the publication of its proceedings. Early in the history of the society, a lecture delivered under its auspices at the Cooper Union, by Prof. H. S. Carhart, on "Radiant Energy" attracted an audience of no fewer than 1,500 people. Prof. Cleveland Abbe, of the U. S. Signal Corps, discussed at another time the subject of "Electrical Clocks." Prof. A. M. Mayer, of the Stevens Institute, lectured before the society on "The Laws of Ohm." Prof. Henry Morton, of the Stevens Institute, delivered another lecture on "The Storage of Electricity." Mr. H. A. Sinclair, the electrician of the Government Ordnance Station at Sandy Hook, discussed, in a manner that attracted the general attention of the press and public, the "Measuring the Velocity of Projectiles." Prof. Vander Weyde during the six years contributed scores of papers, illustrated lectures, memoranda, etc., on the most varying topics connected with electricity; and during the same period the following well-known electricians and experts, in addition to the above, also contributed original papers: Messrs. F. W. Jones, G. A. Hamilton, F. W. Cushing, G. B. Scott, H. L. Bailey, J. Hamblet, C. S. H. Small, H. W. Pope, E. A. Leslie, G. K. Winter, A. A. Knudson, C. O. Mailloux, W. P. Phillips, N. S. Keith, S. P. Frier, P. B. Delany, A. E. Dolbear, L. J. Blake, T. D. Lockwood, P. Gannon, J. Wetzler, G. W. Mansfield, J. J. Ghegan, T. Wolcott, A. C. Fowler. This list, as read by President Pendleton, though necessarily not complete on account of the long period covered, showed how strong had been the interest in the society through several years, and how ready leading electricians had been to place their services at its disposal for the furtherance of its welfare and in the promotion of science.

The address of President Pendleton was followed by speeches from Mr. J. D. Reid, the veteran associate of Morse, in response to "The Telegraph"; Mr. C. O. Mailloux, to "Electro-Chemistry"; Mr. C. C. Wheeler, to "The Electric Motor"; Mr. H. C. Davis, to "Our Guests"—accompanying a brief, pithy reply with a capital, ringing song; Mr. A. A. Knudson, to "The Electrical Transmission of Energy"; Mr. R. Grimshaw, to "Our Sister Sections of the Institute"; Judge John A. Grow, to "Electricity and the Law"; and Mr. T. C. Martin, to "The Scientific Press"—which was followed by the reading of the poem, "The Polychromotelepantophotophonograph." During the evening the secretary read letters of congratulation and regret at absence from Profs. G. F. Barker, E. J. Houston and H. Morton; Secretary W. H. Wahl, of the Franklin Institute; and Messrs. E. H. Johnson, G. W. Hebard, E. H. Goff, T. T. Eckert, W. J. Johnston, F. L. Pope and several others. The whole affair was of a most happy and interesting character, and will be long remembered with pleasure by all who participated.

Much interest was created by the examination during the evening of a volume, now very rare, being the report of the Commissioner of Patents for 1843, containing Morse's telegraph patent and a description of the system patented by Ezra Cornell of laying wires under ground in pipes. It was presented to the society by Mr. Baldwin, the patent expert of Washington.

"Visual Synchronism."

A special dispatch of May 12 from Washington says: J. Harris Rogers, of Pan-Electric fame, has published a pamphlet describing a new invention of his entitled "Visual Synchronism." Mr. Rogers asks for $100,000 to organize a company to work the patent, and promises a return of $100 for $1 on the investment in a short time. As the practical applications of "Visual Synchronism," he says:

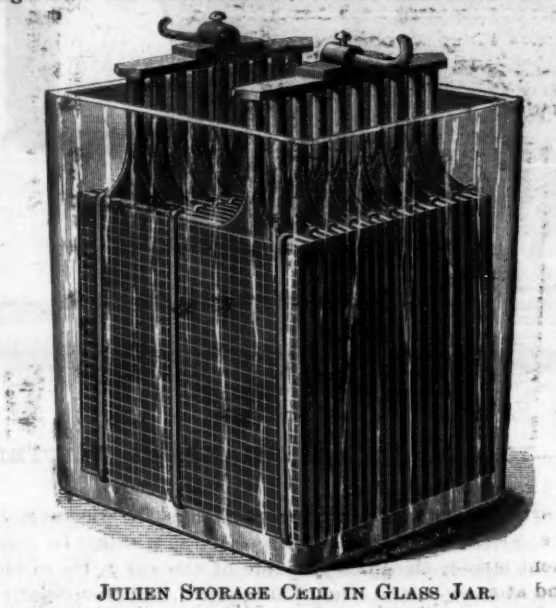
"It enables one in effect, though not in reality, to see by electricity any number of revolving wheels, or moving mechanism, thousands of miles away, so that absolute harmony, or synchronism, is preserved to them all. Of course, many applications of the new system may be made, wherever wheels or moving mechanism may be utilized in telegraphy, electric locomotion, horology, printing, etc. The new synchronism may now be seen by any one, as absolute and working perfectly for all practical purposes, at an almost incredible velocity. It solves the greatest problem of electrical communication, and will render messages so cheap, it is predicted, that all governments must adopt it, and ultimately send their letters by wire instead of rail."

Mr. Rogers believes that by this system he will be able to transmit photographs, landscapes and handwriting by electricity. In conclusion he says:

"Capital is invited; but Pan-Electric statesmen, of the high-stepping variety, who expect to get control of the patent by promising their great names to float the stock, while conspiring to pocket money without risking their august names on the stock promised, 'need not apply.' We want honest business men. A plague upon greatness! If my earlier patents got mixed up against my will by statesmen, with a government job, the present enterprise should not be confounded with their failures, for I trusted them in good faith. No one should blame me for having selected them, and visual synchronism, not being encumbered by their names, should not be tainted by their follies. It appeals confidently to science and practical knowledge for success."

The Julien Storage Cell.

We have already from time to time given illustrated descriptions of the accumulators of the Julien Electric Company. The cut herewith is a view of the cell as now made and when used with a slightly flaring glass jar. The standard accumulator of this company is that known as type B. It consists of 19 plates, 9 being positive and 10 negative, weighing 27 lbs. net, *i. e.*, without the containing box or the acid solution, which make an additional



JULIEN STORAGE CELL IN GLASS JAR.

weight of from 6 to 7 lbs. The positive plates are indicated by red paint on the connecting strip. Following are the principal details of the type B accumulator:

Floor space	6½ × 5¾ inches
Height	8 "
Net weight	27 lbs.
Total	34 "
Quantity of solution	about 1¼ quarts.
Strength " in degrees Baumé	23°
" " specific gravity	1.185
Electromotive force	2 volts.
Internal resistance	.001 to .005 ohm.
Current of charge	up to 18 ampères.
" discharge	" 36 "
Current capacity of each accumulator	125 ampère hours.
Energy capacity of each accumulator (C.E.)	250 volt ampère-hours or watt hours

Multipled Magnets.

BY I. H. FARNHAM.

For the benefit of those readers of THE ELECTRICAL WORLD who were interested in my article on the above subject, printed in the issue of Jan. 29, 1887, I give the results of another experiment which may best be read in connection with that article:

Having had nine magnet bells of a standard make rewound to 20 ohms, and another similar nine bells of 80 ohms connected in multiple, *i. e.*, the ringing coils of each of the second nine connected in multiple, I arranged the two sets in two branch circuits in such a manner as to quickly include either in the talking circuit. By thus alternately trying the two sets of bells both in long and short circuits, with and without additional resistance, no difference whatever could be perceived in the loudness or clearness of conversation.

Taking either the set of low wound or the set of multipled bells against ordinary 80-ohm series connected bells, it was found that three of the latter would cause fully as much, if not a little more, trouble in talking, than was experienced with either of the nine.

The tests of ringing with and without outside resistance showed no difference in favor of either method of reducing the resistance of the coils and consequent sensibility of the cores to passing currents. No effort was made to have the two coils of a given bell exactly alike in resistance; in fact, variations from one to three ohms were found to exist.

Twixt Irons.

To the Editor of The Electrical World:

SIR: Among the several suggestions for the unnamed space in a dynamo, please allow me to place the words "twixt irons."

L. P. BRUNELLE.

QUEBEC, Can.

Electro Deposition of Iridium.

Although Smee states that in his experiments he succeeded in depositing iridium in a bright reguline state on a small scale, the many succeeding attempts to deposit this hard and incorrodible metal have, as a rule, been unsuccessful, as the metal was usually deposited in the form of a black powder.

In a patent recently issued to Mr. Wm. L. Dudley, of Covington, Ky., the inventor describes a process of depositing iridium, by means of which a bright, flexible reguline deposit is obtained.

The inventor uses either an aqueous solution of the double chloride of iridium and sodium or of the double chloride of iridium and ammonium, containing about two ounces of metallic iridium to the gallon, and acidified with about one-half an ounce of sulphuric acid to the gallon.

The solution of the double chloride of iridium and sodium is prepared as follows: The hydrate of iridium is dissolved in the least possible quantity of hydrochloric acid and evaporated in a water bath to expel the excess of acid. The residue is then dissolved in water and an amount of sodium chloride is added sufficient to combine with all of the chloride of iridium present to form the double salt. The solution is then diluted to the required amount, so as to contain about two ounces of metal to each gallon of liquid. The required amount of sulphuric acid is then added, and the solution is ready for the electro-deposition.

The solution of the double chloride of iridium and ammonium is prepared as follows: The hydrate of iridium is dissolved in the least possible quantity of hydrochloric acid and carefully neutralized with ammonium hydrate. It is then acidulated with sulphuric acid until all of the precipitate produced by the ammonium hydrate is dissolved, and finally diluted with water until each gallon of the liquid contains about two ounces of the metal. The solution is then ready for work when acidified, as before mentioned.

From both of these solutions Mr. Dudley obtained a thick, bright and reguline deposit of iridium; and he has found that a plate of iridium or phosphide of iridium, as made by the Holland process, if used as an anode, will dissolve in these solutions while the current is passing.

As in electroplating with other metals, it is essential, to obtain good results, that the articles to be plated should be perfectly clean. A brighter and smoother deposit is obtained if the articles are highly polished before they are introduced into the iridium bath. In plating articles which are readily attacked by the solution it is of course desirable to first coat them with some metal not appreciably affected by such solutions.

In the deposition of iridium from any of its solutions it is necessary to avoid battery power of too great intensity; and in case the intensity be too great, it can be recognized by the deposit becoming dark and powdery, and also by an excessive evolution of gas from the surface of the anode and cathode. In managing the solution, alkalinity should be avoided, although neutral solutions may be employed; but acid solutions are to be preferred.

During deposition, where a thick deposit is required, it may be found necessary to remove the articles from the solution from time to time, and to wipe them in case the deposit should have a tendency to become black; but this blackness may be avoided by proper manipulation of the solution and battery power, and also by proper cleansing of the articles. It is also found that when the articles to be plated are kept in gentle motion during deposition the deposit will take place faster and be brighter and thicker than if they are allowed to remain stationary. Mr. Dudley does not claim, however, that the plating produced by his process will resist the action of acids which will dissolve finely divided iridium.

Priority in Series Electric Railways.

To the Editor of The Electrical World:

SIR: If you can spare enough of your valuable space, I would like to make a profound bow to Mr. R. M. Hunter, and request the humble privilege of saying "boo!"

Mr. R. M. Hunter notes "the statements of Cecil P. Pool in your last issue, in which he claims to be the *original inventor* (the italics are mine) of the 'series' (railway) system." I beg leave to assure Mr. R. M. Hunter that he is sadly in need of either a good pair of spectacles or a Minerva to keep him in the paths of rectitude. (I beg the pardon of Telemachus and all the mythological family, if I leave an invidious inference.)

My former letter to you made no such claim as quoted by Mr. Hunter, *i. e.*, that I was the original inventor of the series railway. I simply wished to point out the fact that the Short-Nesmith system was not new, and to sustain this point, stated that the system was identical with one devised by me in 1881, etc. If Mr. Hunter can find anything in this statement arrogating *absolute* priority, he is at liberty to start an argument, but it does seem that Mr. Hunter should await the presentation of the claim in question before he attempts to refute it.

I regret that my clumsy phraseology should have clouded Mr. Hunter's comprehension, and if I should ever make any more "statements," I will be careful to label them, on the principle of the schoolboy legend, "This is a hoss, his tail is blew."

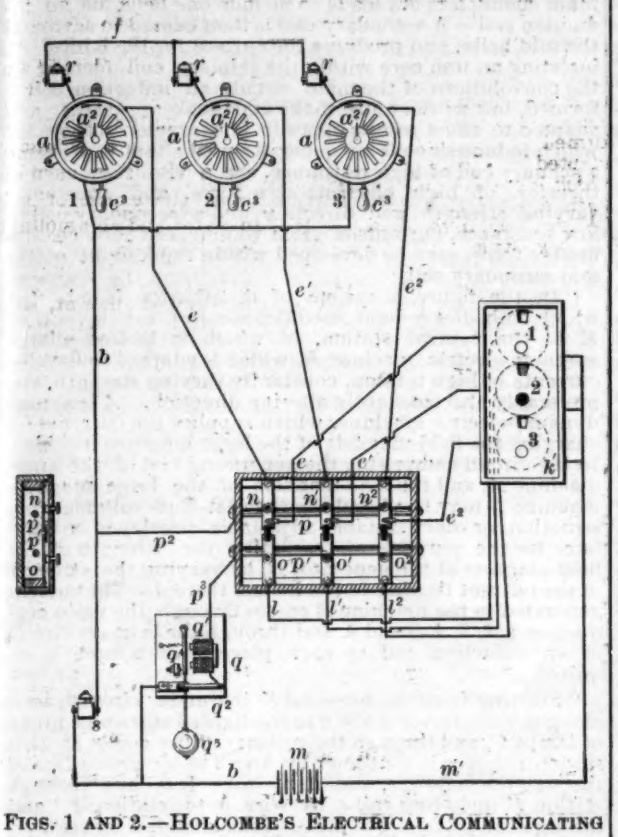
I may add that the pamphlet descriptive of the series

railway system, "invented by ME in the winter of 1877 and 1878," had not dazzled the simple people of a country town called Baltimore (in Maryland, Mr. Hunter), up to the tenth of June, 1883, at which time I left that little village.

CECIL P. POOL.

Holcombe's Electrical Communicating System.

At a recent meeting of the New York Electrical Society—the electrical section of the American Institute—Mr. Alfred G. Holcombe exhibited a model of a system of electrical communication, by means of which a guest at an hotel can communicate to the clerk wants to the number



FIGS. 1 AND 2.—HOLCOMBE'S ELECTRICAL COMMUNICATING SYSTEM.

of fifteen. Before entering into the manner of operation of the system, we will first describe the various details of which it is comprised.

The diagram, Fig. 1, shows the elements of the complete system.

The call or signaling box shown in detail in Figs. 3, 4 and 5, has the "wants" marked or printed on its face a, on radial lines, as shown at Fig. 1, in which view for want of space the wants are indicated by figures. On the central shaft a^1 in front of the face a, is secured the pointer a^2, and thumb piece by which it can be rotated,

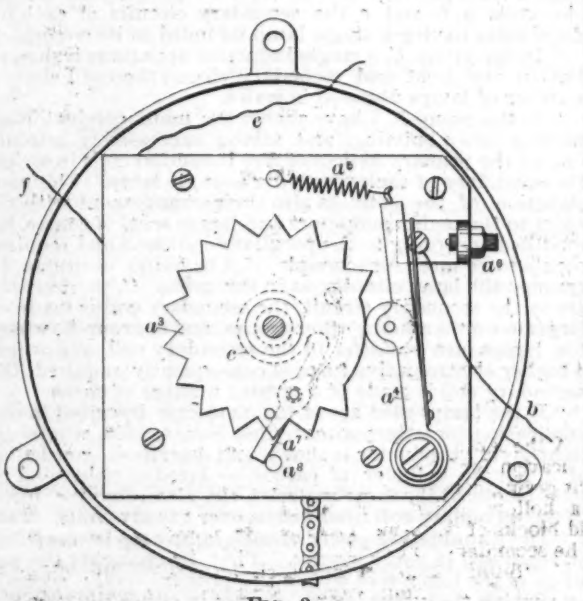


FIG. 3.

and immediately behind the face is located the serrated disc a^3, rigidly secured to the shaft a^1, and provided with as many teeth as there are signals or wants. A roller on the lever a^4, pivoted to the frame of the instrument, is caused to bear against the edge of the disc a^3, by means of the spring a^5, and this lever, when the disc is rotated, is caused, by the action of the teeth of the disc against the roller, to make contact with the insulated stop a^6. This stop a^6 is joined to the main line b of the system. At the back of the disc a^3, and pivoted to it, is the spring-acting hooked pawl a^7, the projecting tail of which strikes the stud a^8, when the pointer a^2 is brought back to the zero position, and thus moves the hooked end of the pawl clear of the notch in the flange c, on the end of the sleeve c^1 through which the shaft a^1 passes, as shown at Fig. 3. To a flanged drum on the sleeve c^1, is attached the chain c^2, which passes down through the lower side of the case, and is provided with a handle. A coil spring c^4 is attached to the rear end of the sleeve c^1, and to the frame; and to this sleeve, just in front of the spring c^4, is secured the insulated lug c^5, which acts as a stop for the spring and determines the normal position of the sleeve c^1, and attached parts by resting against the end of the lever switch d, to which the individual line e is connected. This lever d, plays between the two insulated stops d^1 and d^2, but is held against the stop d^1, to which the collective line f is joined by the lug c^5, and is brought into contact with the other stop d^2 by the spring d^3 when the sleeve c^1 is rotated. This stop d^2 is electrically connected through the frame

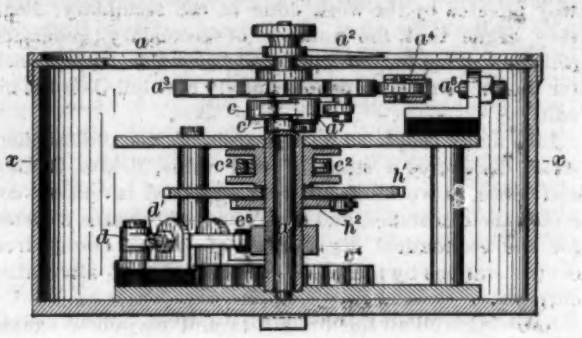


FIG. 4.

to the lever a^4. The speed-controlling gear h, h^1, h^2, is of the ordinary construction.

In the indicating annunciator three sections only are shown, and in Fig. 6 a different face view of the mechanism of each section is given. The electro-magnets of all sections in each vertical row of the annunciator are composed of a single bar of iron provided with pole pieces i, between which the coils of insulated wire i^1 are wound. In front of each of the coils, hinged to a pole piece, is an armature i^2, the free end of which faces the pole piece next above the one to which it is hinged, thus forming a nearly closed magnetic circuit with the part of the bar constituting the core between the adjacent pole pieces. The shaft j extends through the frame in front of the armature i^2 and is provided with the ratchet wheel i^1, into which plays the hooked pawl i^3, pivoted to the upper end of the armature i^1, the pawl being held in contact with the ratchet wheel j^1 by the spring i^4, which also draws the armature away from the pole piece i of the magnet. The extent of the movement of the armature is determined by the adjustable screw j^2, fitted in the bell crank lever j^3, the outer arm of which is provided with a pin arranged to come in contact with the teeth of the ratchet wheel, and thus lock the wheel when the armature in its retrograde movement strikes the screw j^2, thus preventing the shaft j and attached parts from being moved further than one tooth of the ratchet wheel for each movement of the armature toward the magnet. The light spring j^4 holds

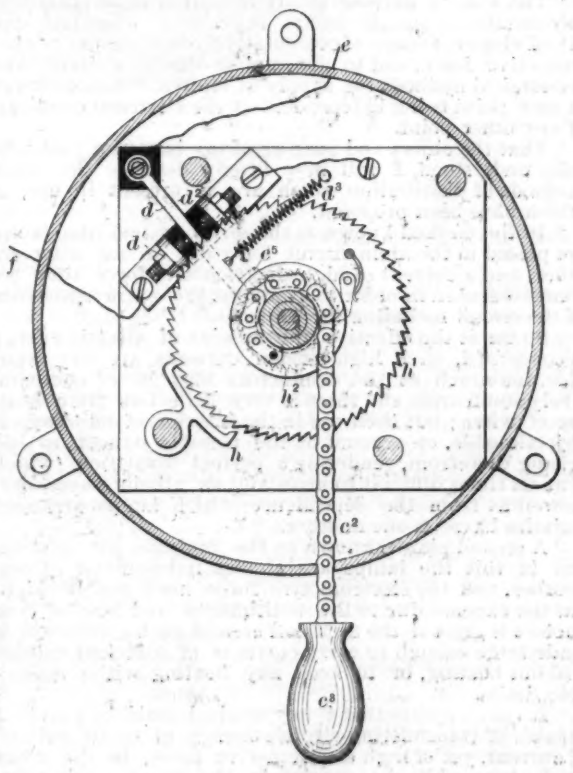


FIG. 5.

the pin on the lever j^3 always against the ratchet wheel, thus causing it to act as a back stop therefor. On the end of the shaft j is secured the disc k, having a series of numbers marked on its face corresponding to the 15 wants marked on the call boxes, and a blank space between the numbers 1 to 15, making 16 divisions in all which correspond to the number of teeth formed on the ratchet wheel. The central part of this disc, with the exception of a circular spot, is made black. The face k^1 of the annunciator has numbers marked thereon indicating the rooms, and each section has two holes, one in front of the blank space between the numbers 1 and 15, and the other in front of the circular white spot on the disc, when the disc is in normal position. But when the disc is rotated by its electro-magnet so as to expose a number in place of the blank space, then a black circle appears in the lower opening which makes a distinctive mark on the face of the annunciator, by means of which the attendant readily observes the number of the room making the call, as shown in Fig. 1. Under the communicator, in Fig. 1, is located a card showing the wants and numbers corresponding thereto.

On each of the shafts j, but insulated therefrom, is the flanged collar k^2, against which the insulated springs k^3 and k^4, Fig. 6, bear, the flange having an insulated piece on which the spring k^4 normally rests. Each of the springs k^4 is connected to one of the individual lines e, e^1, e^2, of the system, each of which is joined to one end of its respective coil i, and the springs k^3 are connected by the

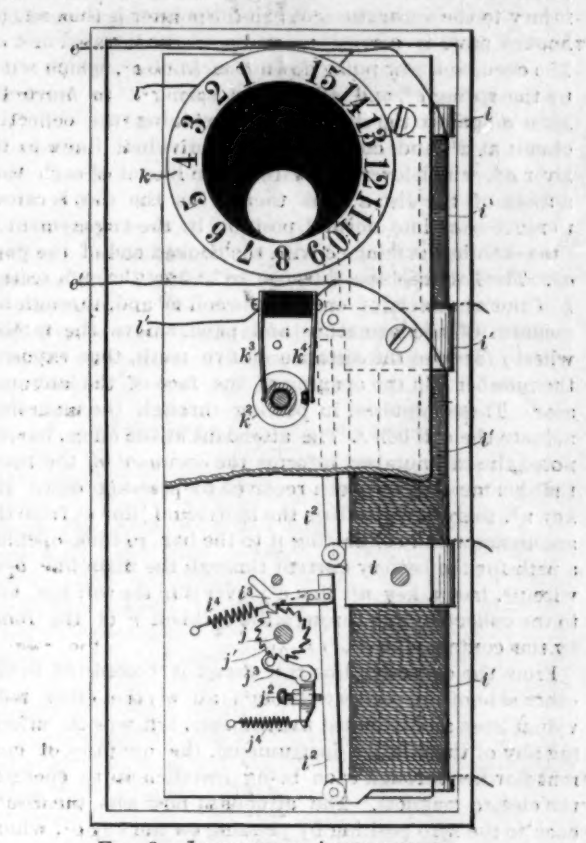
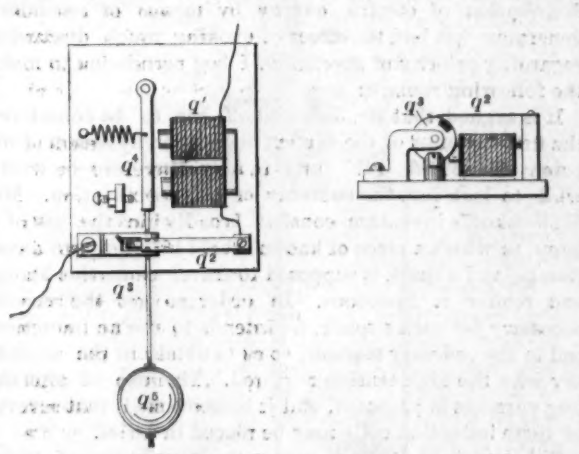


FIG. 6.—INDICATING ANNUNCIATOR.

lines l, l^1, l^2, respectively, to the switch box described below.

The other ends of the coils i are connected to one terminal of the battery m by the line m^1, the main line b being joined to the other terminal of the battery.

The switch box at the central office, Fig. 1, and shown in transverse section in Fig. 2, contains two sets of keys, the upper set n, n^1, n^2, being included in the individual lines c, c^1, c^2, and normally closing these lines, and the other set o, o^1, o^2, constituting the terminals in the switch box for the lines l, l^1, l^2. The keys of the two sets are arranged in pairs, the keys o, o^1, o^2, being provided at their ends with projecting pieces of non-conducting material overlapping the ends of the keys n, n^1, n^2, but not connected thereto. Located under these two sets of keys are the bars p and p^1, respectively, both connected to the main line b, the bar p by the wire p^2, and the bar p^1 by the wire p^3, the



FIGS. 7 AND 8.—THE CIRCUIT CONTROLLER.

latter including the device q arranged to automatically make and break, at regular intervals, the circuit of the current passing through it.

This circuit-controller, shown enlarged in Figs. 7 and 8, comprises an electro-magnet q^1, a spring q^2, resting on a pivoted metal disc q^3, included in the circuit, a pivoted armature q^4, actuated by a spring against the attraction of the magnet thereon, and provided with an adjustable weight q^5, by which its beats as a pendulum can be regulated. The pendulum rod passes through a notch cut in the disc q^3, thus causing the disc to move on its pivot and bring an insulated piece fitted on its periphery under the spring q^2 when the armature approaches the magnet, thereby breaking the circuit, which is again closed when the armature moves away from the magnet. By this construction the time during which the current is flowing through the magnet is much increased over that in the ordinary spring acting vibrating circuit closers, and positiveness of action consequently assured.

In each of the rooms, Fig. 1, is located a call-bell r, placed in the collective line f, which is common to all of the

rooms. And a call bell s is placed at the central office, in the main line b between the lines p^2 and p^3.

All the circuits are normally open, so that no waste of battery power occurs, and the one battery supplies the current for all operations carried out by the system.

The wants included in the list are such as to meet the general demand. As an example of the working of the system, suppose that the occupant of room 2 wants a messenger. He simply turns the pointer a^2 of his call box until it lies over or points to the word "messenger." This in itself does not affect the circuits, and the pointer can be rotated back and forth indiscriminately without any injury to the apparatus. When the pointer is thus set, the hooked pawl is carried around with the serrated disc a^3. The occupant now pulls down the knob c^2, which winds up the spring c^4, and allows the spring d^2 to move the lever d against the stop d^3, thus breaking the collective circuit at d^1, and connecting the individual line e to the lever a^4, which lever closes the main line at a^5 each time a tooth of the disc a^3 acts thereon as the disc is caused to move back into normal position by the engagement of the notch in the flange c with the hooked end of the pawl a^7. The five impulses thus caused to flow through section 2 of the annunciator energize its coil i^1 and, through the medium of the armature and pawl, move the ratchet wheel j forward the distance of five teeth, thus exposing the number 5 in the opening of the face of the annunciator. These impulses, in passing through the main line, actuate the call bell s. The attendant at the office, having noted the call number, informs the occupant of the room that his message has been received by pressing down the key n^1, thereby separating the individual line e^1 from the annunciator and connecting it to the bar p, thus opening a path for the battery current through the main line b to wire p^2, bar p, key n^1, line e^1, lever d in the call box, and to the collective line through the call bell r of the room by the contact stop d^3.

From the collective line the circuit is completed to the other side of the battery through all of the other individual lines and included instruments, but without affecting any of these latter instruments, the quantity of current flowing through each being insufficient to energize the electro-magnets. The attendant now sets the disc k back to the zero position by pressing on the key o^1, which breaks contact between the key n^1 and the line, by which it is connected to the annunciator and closes the circuit through the vibrating circuit breaker q, the springs k^3, k^4, and the insulated flanged collar k^2, the insulated section in the flange of which is now away from the spring k^4, the coil i and the battery m, the lines involved being part of the main line b, the wire p^3, line l^1 and line m^1. The current, because of the interruptions in the circuit caused by the circuit breaker q, flows in impulses, each impulse causing the armature i^2 to move the ratchet wheel j^1 one tooth, and this operation continues until the insulated part of the flanged collar k^2 comes under the spring k^4, in which position the disc k exposes the zero mark or blank space.

Concerning the History of Secondary Generators.

To the Editor of The Electrical World:

SIR: As the attention which has lately been paid to the distribution of electric energy by means of secondary generators has had the effect of evoking much discussion regarding priority of invention, I beg permission to make the following remark:

It is argued that Mr. Jablochkoff has to be considered the first inventor of the system in question by reason of his patent No. 1,996, 1877, and it may therefore be worth while to look into the contents of this specification. Mr. Jablochkoff's invention consists broadly in the use of a lamp, in which a piece of kaolin is held between two metal clamps, and a spark is supposed to travel along this kaolin and render it luminous. In order to get the tension necessary for such a spark, he intends to use an induction coil in the ordinary manner, so as to obtain in the secondary wire the high tension required. The use of alternating currents is proposed, and it is mentioned that several of these induction coils may be placed in series.

This certainly does not mean the conversion of high-tension currents in the main into low tension currents for the lamps, which is a fundamental point of the present system of distributing electric energy by means of secondary generators. On the contrary, it is quite clear that Mr. Jablochkoff's system may be considered the very reverse of it. If the lamps have worked at all, the tension in the secondary wires must have been such as to make a contact rather unpleasant. A very broad claim attached to the specification does not alter the essence of the invention.

In the following year, 1878, we find several inventions in which induction coils are mentioned. As no other system but lighting in series was considered at that time, it seemed to be the main object of those inventors, as De Meritens and Fuller, to avail themselves of induction coils for the purpose of preventing an interruption of the circuit; the lights being actuated by the secondary circuit, the primary remained intact in case of interruption in any of the lamps.

Messrs. Gaulard and Gibbs conceived an idea of improving the incandescent lamp by means of an induction coil, as described in their patent No. 4,242, 1881, in which they desire to utilize the quantity and the intensity of an electric current, the quantity being supplied by the primary current of the induction coil and the intensity by the secondary. Still laboring under a mistaken idea, they took out their patent No. 4,362, 1882, sealed on the 13th of March, 1883, in which several induction coils are shown in series, the current for the primaries being supplied by an alternating-current dynamo. Messrs. Gaulard and Gibbs imagine that the current in the primary is in no way affected by the work done in the secondary, hence they argue that the number of secondary generators (this new name for induction coils seems to appear here for the first time) can be indefinitely multiplied on the circuit.

Like many people who, in search of the philosopher's stone, discovered a stone of real value, Messrs. Gaulard and Gibbs, in working out their supposed invention, corrected their mistakes, and developed afterwards a system for the economical distribution of electric energy from central stations by means of transformers of alternating currents.

Knowing well all the difficulties and prejudices against which a new invention has to fight its way, I gladly avail myself of this opportunity to express my admiration and regard for the perseverance which these gentlemen have displayed in bringing this system into practical operation.

I may now be allowed to speak of myself. In 1882 I was engaged in experiments on incandescent lamps, and in order to test the vacuum of one of them I wanted to make use of an induction coil. The lamps were connected in parallel, and as a matter of experiment a Ruhmkorff coil, with make and bre ak, was put into the circuit in the same manner as the lamps. The fact that this could be done demonstrated that the active resistance produced by the counter E. M. F. prevented short-circuiting of the dynamo through the very small passive resistance of the primary which would otherwise have occurred. I then commenced a series of experiments with the induction coil as a dynamic apparatus, and ultimately made an application for an American patent, filed January 29, 1883, in the United States Patent Office, which application has hitherto been hidden from public notice for reasons mentioned already on a former occasion.*

I have lately received a copy of my American application from Mr. Thomas D. Lockwood, the well-known electrician of the Bell Telephone Company, who kindly acted as my attorney in this matter. I have no copy of the drawing, but I think the description is perfectly clear without it. The application reads literally as follows:

"My invention relates to the efficient distribution of electric energy, primarily for utilization in electrical illumination, although the system is equally well adapted for use in any other application of current electricity, or the energy resulting from the transfer thereof from place to place.

"The aim or purpose of my invention is to provide at any number of specific points or places an abundant supply of electric energy of comparatively low tension or electromotive force, and to accomplish this by a simple and economical method; the supply of electric force or energy at each point being independent of the electrical condition of any other point.

"That the object and purpose of my invention may be fully understood, I will now briefly describe the other methods of distribution which are at present in use, or which have been proposed.

"In the method known as the series system the lamps are placed in the main circuit *seriatim*, or one after another, and a current of high electromotive force thus becomes essential in order to overcome the extra resistance of the circuit including the lamps.

"So far as the effective transmission of electric energy is concerned, such high-tension currents are very desirable, inasmuch as the conductors may be of comparatively small area, and there is very little loss from heating of wires; but their use in the interior of buildings is objectionable, on account of the possible danger to life arising therefrom, rendering a perfect insulation (which is at all times difficult to maintain) an absolute necessity, as well as from the dependence which lamps arranged seriatim have on one another.

"A second plan is known as the multiple arc system, and in this the lamps are almost independent of one another, and the electromotive force need not be high; but the expense due to the multiplicity and size of conductors is great if the sectional area of such conductors is made large enough to carry currents of sufficient volume without heating, or to keep any heating within reasonable limits.

"It thus appears that if any method could be provided capable of transmitting electric energy of small volume of current, yet of high electromotive force, in the main conductors, while the current in the house conductors, which include the lamps, should be of the requisite strength to fully energize the lamps, yet remaining of low electromotive force, the objections inherent in both systems would be to a great extent eliminated.

"The use of secondary batteries has been proposed as a method for the practical achievement of this object; the same being adapted to be charged in series and discharged through the working circuit in multiple arc. Up to the present time, however, the secondary battery has proved in actual work to be untrustworthy, and it is not economical in the reproduction of electric energy. Still another method of obtaining the desired end would be the employment of intermediate generating stations in the manner hereinafter described—viz., In each of the intermediate stations where the electrical energy is to be used two dynamo-electric machines are employed, one of them wound with a large number of convolutions of comparatively fine wire, and receiving its electricity from the main conductors. It is thus adapted to operate as a motor, and drives the second dynamo machine, which produces currents of any suitable character required, according to the size and number of convolutions of the wire used in its coils.

"I will now proceed to describe fully the method which forms the subject of my invention, and which I illustrate by a diagramatic drawing. I place in the central station, where the electric energy is to be developed, and from whence it is to be distributed, a magneto or dynamo electric generator adapted to produce undulatory currents—that is, electric currents of continuously varying strength. These may also be of alternating direction.

"From this central point, the currents thus developed are conveyed by main conductors through the streets, but these main conductors do not include any of the lamps in the circuit, and do not carry any branch wires. In the places where a light is required, or is to be produced, the main conductors are made to include one helix of an induction coil. A secondary coil is then caused to surround the said helix, and produces the current for the lamps. By inserting an iron core within the primary coil formed by the convolutions of the main circuit an induction coil is formed, but without any make and break apparatus, and adapted to effect results opposite in c. aracter to those for which induction coils are generally used; that is, by using a primary coil of high resistance, and a vitalizing current therefor, of high electromotive force, and constantly varying strength and direction, and a secondary coil of low resistance, currents of great volume, but low electromotive force, may be developed within the circuit of the said secondary coil.

"In the figure a system of distribution is indicated which embodies several modifications of my invention. K is the central station, in which is located a large magneto-electric machine B, which is adapted to develop currents of high tension, constantly varying strength, and preferably also constantly altering direction. A is a small dynamo-electric machine, which supplies the currents for charging the field-magnets of the large magneto machine. In the circuit comprising the generating coil of the small machine A, and the field-magnets of the large magneto machine B may be placed the rheostat R of suitable construction, or other suitable adjustable resistance or regulator for the purpose of regulating the strength of the field-magnets of the generator B, by varying the strength of the current flowing in the helices thereof. The current generated in the machine B passes through the main conductors 1, 2, 3, 4, 5 and 6, and through the primary circuit of an induction coil at each place where a light is required.

"Starting from the terminal S the main circuit passes along the conductor 1 and 2 to the lighted station or group of lamps C, and through the primary of the coil a at that station; thence it continues by wire 3 to the group D, and through the coils b, c, and d by wire 4 to and through station E, including coil e, by wire 5 to station F, and through the primaries of all the coils included thereat, returning ultimately by wire 6 to terminal S' of the magneto generator B.

"In the group represented, at C I have shown four lamps l of the incandescent class, arranged in as many parallel circuits m m', all branching from the two main terminals of the secondary coil a. This is an adaptation of the multiple arc system of connection. In this case the main conductor is entirely outside the building, and the method of operation as follows: The current in the main conductor passes through the primary of the coil a, exciting currents of low tension and considerable volume in the secondary thereof, which divides between the several branch or parallel circuits thereof, illuminating each of the lamps r.

"In the group shown at D, three lamps are shown, each of which is provided with an individual inductorium, the main circuit passing successively through the primaries of the coils a, b and c, the secondary circuits of each inductorium having a single lamp included in its circuit.

"In the group E, a single induction apparatus is shown, but in the local and secondary circuit thereof I show a number of lamps disposed in series.

"In the group F, I have shown the main conductor as passing into a building, and taking successively into its circuit the primary helices of five induction coils in series, the secondary of each supplying a single lamp. The construction of the coils, as also their arrangement with respect to the main conductors and lamps will, of course, be modified according to the peculiar conditions and requirements to be met; for example, if it be found desirable to arrange the lamp circuits, as in the group C, in multiple arc in the secondary circuit, the secondary coil is made of larger wire than in the other groups, and in group E, where the lamps are *seriatim* in the secondary coil, and where a higher electromotive force is consequently required, the secondary coil is made of a greater number of turns.

"If the lamps used are of the character described in my application for letters patent, filed Nov. 4, 1882, wherein a light giving conductor is shown and described, consisting of a hollow cylinder of carbon socketed at either end in solid blocks of the same material, the electromotive force in the secondary coil need not be over twenty volts.

"The illuminating power of each lamp can be modified or regulated in various ways. First, by changing the position of the inner core within the primary coil; second, by varying the active length of wire in either the primary or secondary coils, or both; third, by interposing an adjustable resistance in the lamp circuit; fourth, by shunting the primary coils with an adjustable resistance, which is the most economical method.

"By opening the secondary circuit, or by completely short-circuiting the primary coil, the lamps may be totally extinguished.

"I am aware that it has heretofore been proposed to use electric lamps in combination with induction coils; but in all such cases the object of such combination was diametrically opposite to the object which I have in view.

"The primary circuit was one of low resistance, and intended to convey currents of low electromotive force, while the secondary coil was of high resistance, and the current developed therein of high electromotive force, in order to overcome the very high resistance of the lamps used.

"In my system of distributing electrical energy the arrangement is exactly the reverse. The resistance in the primary circuit is high, the electromotive force generated by the magneto-electric machine at the central station is high, while the electromotive force generated in the secondary coil is a low one; the entire arrangement being for reasons which are fully explained therein."

To this application I should like to add that there are, of course, several sentences in it which I should like to

* ELECTRICAL WORLD, December 4, 1886.

modify to-day, after more than four years have elapsed. Especially have I entirely modified my views with regard to the direct use of continuous high-tension currents.

ALEXANDER BERNSTEIN.

THE BERNSTEIN ELECTRIC LAMP COMPANY (LIMITED), LONDON, Eng.

The Nature of Electricity.

BY CARL HERING.

In THE ELECTRICAL WORLD of April 23 was published a communication from me in which, for the sake of discussion in the paper, I advanced an argument which appears to indicate that electricity is matter and not force.

In the two answers published May 7 and 14 I have been misrepresented, your correspondents having changed not only the meaning of the terms which I used, but even the terms themselves, and with this new and different interpretation, together with other uncalled for expressions, they have endeavored to show that the original argument was absurd. Such an answer it is needless to say is neither creditable to the writers nor just and fair to me.

I was well aware of the fact that force and energy are not identical, and therefore when I said force I did not mean energy, or I should have been likely to say so. Your correspondents need only to refer to the absolute system, in which they will find that the "dimension" of force is $\frac{m\,l}{t^2}$, while that of work is force multiplied by distance, that is, $\frac{m\,l}{t^2} \times l$, and that of power is $\frac{m\,l}{t^2} \times \frac{l}{t}$. But even granting that everything is either energy or matter, instead of force or matter, the same argument may be used regarding the nature of electricity.

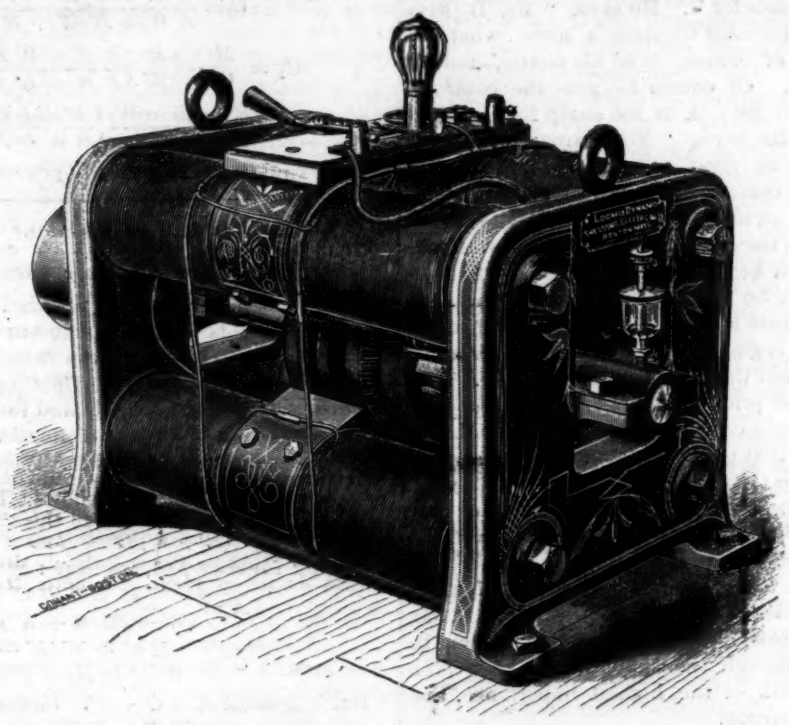


FIG. 1.—LOOMIS DYNAMO FOR ELECTRIC LIGHTING.

Force is *that which causes acceleration*, or, as Professor Dolbear states it, the rate of change of momentum, which is the same thing. Energy of motion of a moving body is measured by the product of its mass and half the square of its velocity. In the absolute system mass is represented by m and velocity by $\frac{l}{t}$ therefore energy (work) would be $\frac{m\,l^2}{t^2}$, which is the same dimension as that of volt-coulombs or electrical energy (work). In this connection it may be interesting to recall that an ohm is a velocity equal to 1,000 million centimeters per second. A short but clear discussion of these units will be found in the excellent little book by Fleming, *Short Lectures to Electrical Artisans*, Chapter 5, and foot note on page 135.

These critics have ma le the mistake so commonly made, of confounding *electricity* itself, measured in coulombs, with *electrical energy*, that is, with volt-coulombs (work), and volt-ampères or watts (power). By reading my letter more carefully, they will find that I referred particularly to electricity and not to electrical energy, as no one doubts that the latter is energy and not matter. This very fact that a volt-coulomb is energy (work), which I believe is not doubted, would tend to indicate that coulombs by themselves cannot also be energy (work), otherwise volts would appear to be mere coefficients or numerals without any "dimension," but this, the absolute system shows, is not the case.

As to the term, matter, I have also been misrepresented. There is no reason whatever why the sense in which I have used the term "matter" should differ from the "certain definite meaning in physical science" which it has, and if your correspondents will consider this more carefully before they attempt to ridicule it, they will, I think, find that they have been mistaken. The reason that we are not yet able to weigh the ether is no proof that it can have no weight. It requires better proofs (which may already exist) than those hasty conclusions of your correspondents to show that ether is not material. It has been taught by what I thought good authority that ether *has* weight, and that, as nearly as I can recall it, a volume of ether as large as the earth weighs between 100 and 200 lbs., though I will not vouch for the correctness or the reliability of this last statement. The remark that it is "immaterial matter" can therefore hardly be tolerated.

According to the hasty conclusions of one of your correspondents, water would be "a form of energy" because it "does work" in a water-fall; for instance, I refer him to any primary book on mechanics. If he will read my first letter more carefully he will find that I am not guilty of making the "popular error." I am not aware that "electricity is readily transformed into heat, light, sound, etc." It is *electrical energy* (volt-ampères or volt-coulombs) but not electricity itself (as measured in coulombs) that may be transformed into other forms of energy. I may be mistaken, but at present I know of no case in which a coulomb of electricity can do any work except when at an electrical potential or pressure (volts), precisely as in the case of water without a pressure, chemical affinity, etc. It is the "volt" which appears to be consumed in doing work, not the ampère or the coulomb, as any one who has run arc lamps in series will know.

Regarding the argument advanced about the 5 storage cells, I need only say that if the correspondent will read my letter with more thought, he will, I trust, be able to see that this example does not meet the argument. According to his argument, if five water motors are driven in series (that is, by a single high pressure current of water) each one actuating a pump which discharges into a common tank, the water which has driven and passed through the motors and "did not stay there" is not "matter," because five times that quantity has been pumped into the tank.

In conclusion, it may be well to add that I profess to know as little about the nature of electricity as either of the correspondents. I did not *prove* that it is matter, as it may be quite possible that it is not; I merely advanced the argument as a "speculation in an idle moment" to "indicate the nature of the problem," and hoped to hear some interesting and good arguments to the contrary, but based on the argument as stated and not with all its terms changed and misinterpreted. The fact that the argument, as it is stated, has not yet been met or weakened, indicates that there may be some truth in it. If it can be *proved* that force and matter, or energy and matter, do not make up the universe, then the argument is based on incorrect premises. The statement that electricity may be ether was not an argument, but merely a suggestion, as will be seen from the first communication.

The Loomis Electric Lighting System.

The accompanying cuts give an exterior view of the Loomis incandescent dynamo, manufactured by the Loomis Electric Manufacturing Company, of Boston. We illustrate also their arc and incandescent lamps. The inventor is Mr. Osborn P. Loomis, a young man of considerable local reputation. The special claims to excellence of his dynamo is its purely automatic action. We are not at present at liberty to give details of construction, but hope to do so at an early date. The company assert that their dynamo (Fig. 1.) is thoroughly self-regulating without the aid of switches, resistance boxes, or any other outside auxiliaries whatever. It immediately conforms with, and adjusts itself to the load it is called upon to carry, with corresponding diminution in the consumption of power as the load is lessened. The efficiency of the machine is said to be very high. The machine is strong and compact in form, and its mechanical construction appears to be such as to reduce all points of friction and the primary resistance of the machine to a minimum, conducive to easy and efficient operation. It is claimed that its capacity for light is not less than ten 16 c. p. lamps per horse-power. Figs. 2 and 3 are exterior views of the arc and incandescent lamps.

The officers of the Loomis Company are Hon. John Warner, President; Benjamin Dickerman, Vice-President; Geo. L. Stevens, Secretary and Treasurer; Osborn P. Loomis, Electrician. The works are at South Boston,

FIG. 2.

with principal business offices in the Equitable Building, Boston, Mass.

The system has already been put in operation in several mills and factories in New England and the West.

Telephone Patents in Canada.

To the Editor of The Electrical World:

SIR: In the case of Hibbard & Wright, to annul Edison patents Nos. 8,026, 9,922 and 9,923, on the ground of importing after the time specified by law, heard before the Commissioner of Patents, March 23, I was called upon as a telephone expert to answer the following question: Whether I considered that the commercial telephone instrument of to-day used by the Bell Telephone Company (the instrument imported) embodies the claims in Edison patent 9,923, which read:

"In combination with a telephonic and the primary circuit of an induction coil, the button of lamp black carbon placed in the primary circuit.

"In combination with the telephone transmitter and receiver the induction coil battery, local circuit switch and circuit connections.

"In combination with the main line circuit, local circuit and the telephonic instrument, the induction coil composed of two wires, the largest of which is surrounded by a finer insulated wire wound helically, the two then being wound into a helix to form the induction coil.

"A transmitting telephone containing a variable resistance in the electric circuit, and a body acting by inertia, to vary the resistance in proportion to the sound vibrations."

In answer I expressed the belief that it did.

In the second hearing, May 6, Mr. T. D. Lockwood appeared on behalf of the defendants, the Bell Telephone Company of Canada (whose stock, by the way, is mostly controlled by the American Bell Telephone Company), in rebuttal, contended that the Edison patents, above referred to, did not constitute a part of the instrument imported (the commercial instrument used by the Bell Telephone Company to-day.)

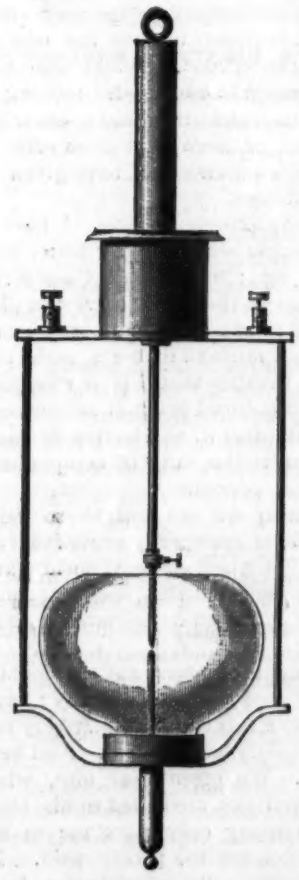


FIG. 3.

Now with all deference to Mr. Lockwood's superior telephonic knowledge, I do not consider he was correct in his assertions. I rather imagine he was influenced by the

position he holds in the American Bell Telephone Company.

The question I am desirous of your answering is, which of the above contentions is correct?

I am sure that the Western Union people will be surprised to hear upon such authority, that the American Bell Telephone Company are independent of their Edison patents. JOHN R. QUAIN.

HOUSE OF COMMONS,
OTTAWA, May 11, 1887.

The Extreme Importance of Attention to Little Things in Telephony.

BY THOMAS D. LOCKWOOD.

PART III.

Details of Operation.

Turn we now to the operating room. There you may find excellent rules, and in some central offices these rules are excellently kept. In other places, unfortunately, the "maiden all forlorn" is a difficult entity to manage. She is instructed that she must not say "Hello?" She must say, "What number, please?" She must listen and find out whether conversation is going on before she slashes into an animated business conversation with, "Hello! Are you through?" She must not chat with the clerks of subscribers. She must not ring with six horse-power for a subscriber and when he responds simply and sweetly ring again into his ear. She must not keep a subscriber waiting when he rings, and when he expostulates, affect to think he has given her some valuable information, and blandly reply, "Thank you, ever so much," and a great many more things that she must not do.

Now, none of us, of course, not even the gentler half of us, like to be controlled, and the very fact that such rules are made is a temptation to break them, and so it is scarcely necessary to say that our sisters do break them quite frequently; and they have, moreover, another exasperating habit, *i. e.*, of sitting back in their chairs to the full length of their (rope I was going to say) head telephone cord, and upon the reception of a call, languidly murmuring, without moving from their passant position, "Hello," which word, by the way, is as unslayable as was the Hydra of Hercules.

I have not the vanity to believe that all the ladies will read this, and I mention it here simply to point out that it is the duty of the chief operator, manager, or superintendent, to look out for these little playful idiosyncracies, and to keep them promptly and strictly suppressed, as far as possible. Since we of the telephonic fraternity occasionally get a taste of them ourselves, we may form some idea of what these amenities sound like to the subscriber. Those of us, therefore, who have the good of the service at heart, should all do what we can to remove them. The lot of the telephone girl is not an easy one; but, after all, there are many employments which are less pleasant, and worse paid; and she, as well as the rest of us, will find her lot ameliorated by the very effort to perform her duties conscientiously and to the best of her ability. In justice to the sisterhood, I should also say that I have often found occasion to admire the untiring and unvarying patience with which they have coaxed together two balky subscribers, or have tried time after time to make wires work which a man would have given up in despair after the first attempt.

Moreover, as my experience goes, I have on the whole found the telephonic service much better than it was two or three years ago; with (shall I say it?) the sole and solitary exception of the night service in places not large enough to afford to pay a person to stay awake.

I think it was a mistake to begin night service in such places, and yet I realize that this it was, more than anything else, which induced original subscribers to come in. But having established it, and having decided to maintain it, I do think it is the duty of companies to provide as efficient service as possible.

A service which we are taught to rely upon, and which in the case of emergency proves to be utterly untrustworthy, is but a broken reed; and I fear that in some places night service is but that, and that some night there will be a serious call upon its resources, and without result.

In such places it is of course not reasonable to expect a night service as good as that of the day; but it should be maintained up to a fair standard. It very easily degenerates unless constantly looked after. And here a word to the night man. We often hear him, when his sins of omission or commission are called to his attention, say—"Well, this company only pays me so much." True enough—many men are too poorly paid. But although one cannot expect college graduates for 15 dollars a month, no man or boy is justified in taking the place unless he is prepared to perform its duties to the best of his ability.

I have now returned to the executive office, and I find a very active fox at the present time is the ever present necessity for retrenchment and economical maintenance; but directors' boards and executive committees should understand that economy and parsimony are terms in any application of electricity wide apart. Yet often they are brought nearer together than they should ever be.

The question of the purchase of an electric cable is up. The manager intending to purchase has the choice of two classes of insulator. One is good, well tried, and his experience assures him would be just the thing; the other is perhaps unknown, but is a trifle cheaper. Which shall he take? He decides to experiment, discards something he knows to be good for something he knows nothing about; but he pays for the experience. My advice is when you get a good thing, stick to it, and when you get responsible parties stick to them.

Another wants a cable and he thinks a small conductor, say No. 24, *ought* to do. It is cheaper, and he can by its use get more conductors into one cable.

He asks his electrician, who has perhaps been through the mill already, with another company.

The electrician advises him never to use a less size than No. 18. The advice is not followed. Our manager thought the duty of the electrician was first of all to agree with him. The cable comes and the work to be got through cannot, of course, compare with what could have been got through the larger conductor.

Less is paid out, but how long does it take the inferior operation to balance this supposed saving? Not long, I am sure. This straining at a gnat and swallowing a camel is one of the apparently little things we have to look sharply after.

Another is the practice which now obtains to a considerable extent in buying electrical goods. It is due to the sharp competition which prevails. Mr. A wants a cable, of such a number of conductors and of such a length. He sends for Mr. B and says, "I want such a cable. What can you make it for?" B figures on it, and gives a price. Does A buy it? Oh, no; he waits till B is out of sight, and sends for C. He says, "Mr. B says he can make me such a cable for such a price; what can you do it for?" C, of course, is on his mettle, and he names a lower price. Of course he gets the contract. Does he though? Oh, no; A is too sharp for that, and goes back to B. He says, "You are underbid; C will make a cable as good as yours for so much less, you will have to come down." B does come down—and so the game goes on *ad libitum* and *ad nauseam*, and somebody finally gets the contract. And I suppose A congratulates himself that he has done so well for his company. It may be that he has, I don't know; but I do know that human nature is weak, and it is very hard for me to believe that he is going to get a cable as good as he would have got without the cheapening process. A good article is worth a good price, and I hope the time is at hand when all telephone companies will see through the eyes of their officers, that the best is always the cheapest.

There is much more to say on this subject, but in what I have already written, there is, I think, abundant food for thought, and when we consider what a small thing the electric current that operates a telephone is, and that if we conclude that it is right to despise the day of small things, we must despise a current only equal to a six millionth part of a Daniell cell on short circuit, it will be conceded that even though the subject may have been feebly handled, it is still of the highest importance, and merits our closest attention.

The telephone interests of the country would gain much if, as it should be, the motto of all laboring in that field, from the president down to the lowest person on the pay-roll, were: "Whatever is worth doing at all, is worth doing as well as it can be done."

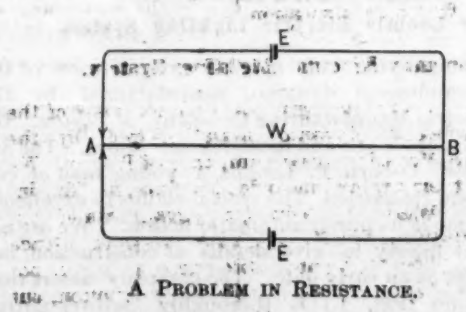
It is a good thing for any young man entering the electrical business to have a kinsman high up in the scale of positions, or to have a director behind him, as a kind of big brother, but better far is it to have a persistent, persevering, painstaking, work-loving nature, and a large modicum of conscientiousness and grit. Eternal vigilance is the price of successful telephony.

An Answer to the Problem in Resistance.

BY PROF. H. S. CARHART.

Mr. Hering's "Another Problem in Resistance," in THE ELECTRICAL WORLD of May 7, is nothing more in principle than the problem of comparing E. M. F.'s by the "compensation method" in a new dress.

If we call the circuit of the cell of larger E. M. F. and



A PROBLEM IN RESISTANCE.

the external resistance the main circuit, then the difference of potential between the points of derivation for the circuit containing the other cell must equal the E. M. F. of this weaker cell, in order to effect a balance. The resistance between the two points of derivation is the resistance required.

Adopting Mr. Hering's symbols, in the accompanying diagram, W is the external resistance between the points of derivation A and B. Then if R is the internal resistance of the cell having an E. M. F. equal to E,

$$R + W : W :: E : E';$$
$$\text{or } R : W :: E - E' : E'.$$

Whence $W = R\,\frac{E'}{E - E'}$, when no current flows through the cell of smaller E. M. F.

Thus, let $E = 1.5$ volts; $E' = 1.2$ volts; $R = 1$ ohm.

$$\text{Then } W = \frac{1.2}{0.3} = 4 \text{ ohms.}$$

The current C flowing in the external or main circuit will, of course, be $\frac{E}{R + W}$, while C' will be zero.

If W is infinite, then $C = C'$ and each equals $\frac{E - E'}{R + R'}$.

If W is zero, $C = \frac{E}{R}$ and $C' = \frac{E'}{R'}$.

The problem of determining "the current which will flow in the external circuit as well as in each cell in a common short circuit" is not exactly a problem of resistance, but one of currents in divided circuits. It can readily be solved by Kirchhoff's laws for divided circuits. If C_1 is the current through the common external resistance W, then we may write the three following equations, from the laws referred to:

$$C + C' = C_1.$$
$$C\,R + C_1\,W = E.$$
$$C'\,R' + C_1\,W = E'.$$

Having three independent equations and three unknown quantities, E. M. F.'s and resistances being known, we may solve for C, C' and C_1 and obtain the following values;

$$C = \frac{R'\,E + W\,E - W\,E'}{R\,W + R'\,W + R\,R'}.$$

$$C_1 = \frac{E}{W} - \frac{R}{W}\left(\frac{R'\,E + W\,E - W\,E'}{R\,W + R'\,W + R\,R'}\right).$$

$$C' = \frac{E}{W} - \frac{R + W}{W}\left(\frac{R'\,E + W\,E - W\,E'}{R\,W + R'\,W + R\,R'}\right).$$

These equations are perfectly general.

The Problem in Resistance Answered.

BY THOMAS SPENCER.

The problem proposed by Mr. Carl Hering in a recent issue of THE ELECTRICAL WORLD can easily be solved by the well-known electrical laws called after their discoverer, "Kirchhoff's Laws." They constitute a general theorem which enables us to find the current in any portion of a network of circuits if the resistance and E. M. F. in the various portions be given. Applying it to this particular case it gives us the following equations:

$$(W - R)\,A - R\,C' = E$$
$$(R + R')\,C' - R\,A = E' - E$$

Solving for A and C', we have:

$$A = \frac{R'\,E - R\,E'}{(W + R)(R + R') - R^2}; \qquad (1)$$

$$C' = \frac{R\,E' + W\,(E' - E)}{(W + R)(R + R') - R^2}; \qquad (2)$$

But in general $A = C + C'$. Hence we have

$$C = \frac{R'\,E - W\,(E' - E)}{(W + R)(R + R') - R^2}. \qquad (3)$$

(1), (2) and (3) give us the most general values of A, C' and C.

Now the first proposition of Mr. Hering is to find the value of W, where either $C' = 0$ or $C = 0$.

Let $C' = 0$; by (2) we have:

$$W = \frac{R\,E'}{E - E'}$$

and for $C = 0$,

$$W = \frac{R'\,E}{E' - E}.$$

In the second case proposed, $W = 0$. From (1), (2), and (3), we easily see

$$A = \frac{R'\,E + R\,E'}{R\,R'} = \frac{E}{R} + \frac{E'}{R'},$$

$$C = \frac{E'}{R'} \text{ and } C = \frac{E}{R}.$$

In the last case where the external circuit is open we have $W = \infty$ (infinity), which gives us also by (1), (2) and (3), $A = 0$, $C = \frac{E' - E}{R + R'}$, and $C = -\frac{(E' - E)}{R + R'}$, or $C' = -C$, which, of course, might have been inferred.

Closure.

To the Editor of The Electrical World:

SIR: Allow me to suggest the name "Closure," for the open space between the armature and pole pieces of the dynamo. It appears to me to fill the requirements of a good name. The space not only closes or connects the lines of force in the armature and magnet, but the two parts must be closed or brought into position before the space is created. D. D. CLAYTON.

UPPER SANDUSKY, O.

Butter Making by Electricity.—At the Agricultural and Dairy Show in the Madison Square Gardens, last week, a "Silver" churn was driven by a C. & C. motor connected up in the regular lighting circuit. The butter made in this way is pronounced excellent by all who have tried it—and it was in brisk demand. A great many of the people who saw the motor running the churn have gone home to think that matter over very seriously. It was a new idea to them.

The Bourseul Magneto-Telephone of 1854.

BY W. C. BARNEY.

I submit that the description of Bourseul's telephone, published in a printed publication in 1854, furnished all the information necessary to make a magneto-telephone, and in this statement I am supported by that eminent scientist, the late Count Du Moncel, who, in *La Lumière Electrique* of Dec. 29, 1883, wrote as follows:

"M. Bourseul avait alors donné une description très détaillée de son système dans le journal *l'Illustration* du 30 Juillet, 1854, description qui ne laissait aucun doute sur les moyens qu'il mettait à contribution."

Bourseul describes one part of his telephone to be "a movable plate, so flexible that it will not miss any of the vibrations produced by the voice," to be vibrated by the magnetism produced in "a piece of soft iron which is converted into a magnet by an electric current passing over a wire."

Will any person have the effrontery to deny that this is not a correct and full description of the instrument generally called the Bell telephone?

Mr. Dickerson, the able electrician lawyer, must have been fully impressed with this undeniable fact, when he stated to the court in New Orleans, that "Mr. Bell has no patent for either a 'transmitter or receiver,'" which statement, however, is in direct contradiction to the claims in Bell's patents of 1876 and 1877.

The following words of Bourseul show what his instruments were intended for. "I have asked myself, for example, if speech cannot be transmitted by electricity; in a word, if one can speak at Vienna and make himself heard at Paris. The thing is practicable, and this is how it can be done."

He then describes an instrument to be operated by the voice to establish and interrupt successively communication with an electric pile. At the other end of the line is an instrument of which he gives this description: An electro-magnet to be affected by a current sent from the other end of the conductor, in combination with a flexible movable plate which will make at the same time exactly the same vibrations.

I admit that there is no evidence that Bourseul ever made a transmitter and receiver as described by him.

These Bourseul instruments, however, having been described and published in 1854, in Europe and in the United States, it is lawful, notwithstanding a patent for one of them has been issued to A. G. Bell, to make and use them together or separately, in any manner and for any purpose whatever, and a patent for similar instruments issued by the United States Patent Office, through ignorance possibly of the Bourseul description, cannot secure to the patentee the monopoly of the manufacture and use of either of the Bourseul instruments. The Revised Statutes, Section 4,886 reads: "A patent may be obtained by any person who has invented or discovered any new or useful art, machine, manufacture or composition of matter * * * not patented or described in any printed publication in this or any foreign country before his invention or discovery thereof."

Did not Bourseul, in 1854, describe an instrument identical in every respect with what is described in Bell's patents, and generally known as Bell's telephone? Bell's one instrument, his telephone, is intended by him to be used both as a generator and transmitter of electrical impulses and as a producer of variations in the force of an electro-magnet.

There is no virtue in Bell's or any other patents to prevent the use of Bourseul's magneto-telephone as a transmitter and as a receiver, or for any other purpose whatever.

In support of this I refer to the decision of U. S. Supreme Court, 91 U. S. 150, Roberts *vs.* Ryer: "The inventor of a machine is entitled to the benefit of all the uses to which it can be put, no matter whether he conceived the idea of the use or not."

"An inventor is entitled to all the necessary and legitimate results attained by his invention, even such as were unexpected." 5 Official Gazette, p. 364, Wells vs. Jacques.

"It is for the discovery or invention of more practicable methods and means of producing a beneficial result or effect that a patent is granted, and not for the result or effect at all."—JUSTICE GRIER.

The discoverer of a principle, who first devises a method for "carrying the principle into effect, and first invents or contrives means to accomplish the several steps in that method is entitled to the exclusive use of the method itself and also of the means by him invented or contrived for its practicable execution."

"Morse was not the discoverer of the laws of nature, which he utilized. He did, however, invent a machine by means of which those laws could be made to carry information to a distance." O'Reilly vs. Morse, U. S. Supreme Court.

In his decision Judge Wallace said: "Bell was not the first to employ the undulatory current, but he was the first to utilize it for copying and transmitting air vibrations." I submit that he did not invent a machine by means of which the undulatory current would be so employed; but Bourseul did invent and publish in 1854 a description of such a machine, identical in construction and operation with that called Bell's receiver.

Bell's fifth claim in his patent of 1876 is for "The method and apparatus for transmitting vocal or other sounds telegraphically by causing undulations similar in form to the vibrations of the air accompanying the said vocal or other sounds, substantially as set forth."

I here ask, does not Bourseul's magneto-apparatus produce the same results in precisely the same way as Bell's?

Judge Wallace, in his judgment in the case of Bell vs. the Molecular Telephone Company, held "that the essential elements of the method are the production of what the patent calls undulatory vibrations of electricity." Does not Bourseul's magneto-machine produce those undulatory currents? And who will presume to say that it cannot be used for that purpose by any person? Bell, therefore, was not the first inventor of the apparatus described by him, and claimed in his fifth claim.

In the case of Bell *vs.* Dolbear, the eminent counsel for Bell said to the Court: "Thus it was reserved for Mr. Bell to publish to the community by this patent (No. 186,787, Jan. 30, 1877) that a sheet of metal could be so constructed, arranged and mounted that, on the one hand, it would have sufficient mass to be attracted, and on the other would be so flexible and elastic as to respond with perfect trueness to the exceedingly slight and subtle variations of pull which are available in the receiver of a speaking telephone."

Does not Bourseul accurately describe such a plate? And did he not publish to the world in 1854 just such a plate to be used, just as Bell's is used?

The new use of an old device is not subject matter for a valid patent. The ignorance of the inventor of all the uses to which his invention may be applied does not permit any person who subsequently discovers a new use for the invention to obtain a monopoly by virtue of a patent subsequently applied for.

I quote the following decisions of Commissioners of Patents:

"The true date of invention is at the point where the work of the inventor ceases, and that of the mechanic begins, and it may be evidenced by description or illustration which demonstrates its completeness." Leggett, Com. Pat. 1871, Cameron *vs.* Buck.

"The mere new application of an old device is not entitled to protection." 1870, Com. of Pat., in re Slawson.

"The mere application of an old process, machine or device to a new use is not patentable. There must be some new process or some new machinery to produce the result in order that the supposed inventor may properly have a patent for the alleged improvement." Commissioner of Patents. 1878.

"When the device is similar to those before known, mechanically, and the purpose to which it is susceptible of being put is the only difference, it is not patentable." Commissioner of Patents. 1869.

In the practice in patents. "The decisions of Commissioners of Patents are binding on the whole office." I insist, then, that had the description of Bourseul's magneto-telephone been known to the Examiner, he would not have been justified in allowing any patent for such a machine.

The law is well settled that a patent for a new use of an old device is not subject matter for a valid patent. Let those who doubt this consult the decisions of the Supreme Court of the United States.

Judge Lowell, in the case of Bell *vs.* Spencer, in Boston, in his judment used these words: "There is some evidence that Bell's experiments with the instrument described in Fig. 7, before he took out his patent, were not entirely successful, but this is immaterial, for it is proved that the instrument will do the work, whether the inventor knew it or not."

The Master of the Rolls, the late Sir George Jessel (who was acknowledged by the Prime Minister of England in announcing his death to the House of Commons, to have been the greatest jurist on the English bench) in a judgment delivered by him in 1882, in a case of infringement of the Bell receiver, said: "Though nobody knows how to make a receiving instrument, if we are told this is a telephone receiver that will give articulate sound, it would nevertheless be a publication, though nobody knew how to work it." And Lord Justice Bowen, on the bench with the Master of the Rolls in the same case, said: "I can conceive an instrument being useless at the time when its use was not known, but which afterwards became useful."

Judge Lowell, in his judgment in the case of Bell *vs* Spencer, said: "Bell discovered a new art, that of transmitting speech by electricity, and has a right to hold the broadest claims for it which can be permitted in any case, not to the abstract right of sending sounds by telegraph without any regard to means, but to all means and processes which he has both invented and claimed."

Now, the "means" which Bell uses to practice the art is a magneto-telephone; exactly such as was described by Bourseul in a printed publication in 1854. Judge Lowell decided that Bell "has not the abstract right of sending sounds by telegraph, but to all means which he has invented:" and as those "means," that is, the instrument Bell uses (the magneto-telephone), was invented and described by Bourseul in a printed publication in 1854, it is evident that Bell did not invent these "means," and therefore under the decison of Judge Lowell, Bell had no claim to the art of transmitting speech, not having invented the "means" to practice the art.

Bourseul's published description of his instruments gives all the details necessary to make a magneto-telephone similar in every respect to those described by Bell in his patents of 1876 and 1877.

A mechanic possessing ordinary skill, with Bourseul's description before him, would make an efficient magneto telephone; he could not fail to do so. Bourseul gives him "an electro magnet, a movable plate, so flexible that it will not miss any of the vibrations produced by the voice," to be vibrated by the effect of a current of electricity passing through the coil on the magnet. The mechanic (in order that the plate may be vibrated by changes of magnetism of the electro-magnet) would necessarily place the plate in front of one end of the electro-magnet, and he would necessarily place the plate in a fixed position relatively to the electro-magnet. Bell's instrument is just such an instrument, and I defy the ingenuity of man to construct an instrument, according to Bourseul's description, in any other way

Professor Bell has stated that he had consulted prior to his application for the patent of March 7, 1876, a translation of "Wonders of Electricity," by J. Baille, Paris, 1868, in English, published by Scribner, 1872, in which Bourseul's receiver is thus described: "At the extremity of the line the current enters an electro-magnet, which attracts another vibrating plate of size and quality identical with the former."

A claim in a patent to the invention of an art which can be practiced by a machine described more than twenty years before the claim was made, and which machine is identical in operation and construction with that claimed as necessary to practice the art, cannot prevent any one using the prior invented machine to practice the art, and for any purpose whatever.

A New Application.—A Sprague motor is to be used at Aurora, Ill., to operate a car which carries the unfinished cars from one part to another of the railway shops there. Some details are given by our Western correspondent in his letter.

The "World's" Air Ship.—Our namesake, the New York *World*, is about to send up a balloon in charge of Mr. Moore, aeronaut, to make a trip across the country, from West to East, starting from St. Louis in June, gathering data as he goes. Observer Hazen, from the Signal Service Bureau, will be of the party, and he will be supplied with apparatus for observation and registration. The idea is a good one, and we trust that the trip will be successful as well as fruitful. Whether the trip succeeds or fails, the *World* is doing another good piece of work.

Electric Smelting.—The plant of the Cowles Electric Smelting and Aluminium Company, at Lockport, N. Y., described and illustrated in THE ELECTRICAL WORLD some little time ago, is to be increased to just double its present capacity. The turbines now in use are two in number of 36 inches each. The new ones will be one 25-inch wheel and one 30-inch wheel, and, like the old ones, they will be made by the Stilwell & Bierce Company, of Dayton, Ohio. The dynamo, which the Brush Company is now making, will be an exact duplicate of the former one, which is already familiar to the readers of this journal.

Sayannah, Ga.—The annual meeting of stockholders of the Brush Electric Light and Power Company was held last week. The Treasurer's report showed the company to be in a flourishing condition. The following board of directors and officers were elected: S. P. Hamilton, D. G. Purse, J. C. Rowland, L. Kayton, Lee Roy Myers, S. S. Guckenheimer, H. A. Crane, C. H. Wilcox and H. Bendheim; President and Treasurer, S. P. Hamilton; Vice-President, D. G. Purse; Secretary, S. S. Guckenheimer. The company is about ready to start up the incandescent system, for which it has been preparing for some time. The machinery is being put in and the wires have already been run. As soon as the dynamos and engines are in position at the works, the system will be put in operation.

New York City Franchises.—Michael Crane, acting for the Ball Electric Light Company, has filed with the secretary of the Gas Commission a proposition to furnish the city with electric lights at 25 cents each a night. He furnishes bonds in $25,000 to make good his proposal. Alderman Van Rensselaer said on May 12 that he doubted whether he would take any further steps to induce the Aldermen to grant franchises to the American, Waterhouse and Ball Electric Light companies. He had no charges to make against any one. The facts had been spread before the public, and it could draw its own conclusions. He knew several of the gentlemen connected with the Brush and United States Electric Light companies, and did not believe they would be privy to any corrupt scheme.

Tickers to Go Back.—In Philadelphia, on May 7, in the Court of Common Pleas No. 2, Judges Mitchell and Fell granted a peremptory mandamus compelling the Electric Reporting Company to restore the commercial tickers which were removed from the Petroleum Exchange on June 29 of last year. The peremptory order was made after argument by counsel, and the tickers have been put back on the floor of the Exchange. At the time the instruments were taken out they were also removed from all the "bucket shops" in the city. The action of the Reporting Committee was taken after notice, on June 29, to the effect that unless the ticking instruments should be taken out of the establishments of brokers and corporations not entitled to the privileges of the Stock Exchange the lease of privileges on the floor of the Exchange to companies engaged in telegraphing stock reports would be canceled and withdrawn. What effect this decision will have on the governing officials of the Stock Exchange is not known. It is believed that the business of the Petroleum Exchange will be augmented from 50 to 75 per cent. by the restoration of the tickers. A suit for damages is to be instituted to recover losses incurred during the interval that the instruments were withdrawn.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
NEW YORK, May 17, 1887.

I have lately found a good deal of interest exhibited by those with whom I come in contact on my rounds, in the subject of the electrical transmission of power, for the purpose of utilizing waste powers and for carrying power to a distance. This subject is fermenting in a good many minds—some of them the brightest in the business—and there will be results. One of the projects recently brought to my attention, I mention, not because it is exceptional in its nature, but because it is on a large scale. At Mechanicsville, in this State, the falls can be utilized at any time for the development of 10,000 horse-power. At present the only or chief use made of the power is, I believe, by paper mills. Now, going in each direction from the falls—where there is a population of 2,000—we have Schenectady with 15,300 and large industries; then Round Lake; then Balston with 3,000, and lastly, at a distance of 20 miles, Saratoga, with a population of 10,000. Coming back to Mechanicsville, and starting the other way, we have Cohoes with a population of 19,400; Waterford with 3,500; Lansingburg with 3,500; Troy with 56,750; West Troy with 8,800; Greenbush with 3,250; and lastly Albany with 91,000, at the same distance of 20 miles. Now, can we electricians do nothing to distribute that energy where it will do the most good? It seems to me that there are great opportunities offered for direct transmission to motors and storage batteries and by the alternating system for lighting, with even three or four conversions if need be. I shall not be surprised to hear that something has been done up there, pretty soon. I may add that Mr. C. A. Wheedon, of Wilkinson Bros. & Co., 74 Duane street, who are running the paper mill at Mechanicsville, will probably be able to give additional information about the place, the power, the population, and the industries included within the district I have named.

The New York Safety Steam Power Company, 30 Cortlandt street, E. T. Copeland, agent, report great activity in the demand for their excellent engines. Among the latest orders filled is an 80 h. p. engine, with boiler, etc., for the Nyack Company (American system); a 250-h. p. for the New Orleans Edison plant, and four 60-h. p. boilers; a 100-h. p. for the Citizens' Illuminating Company, of East Boston (American system); two 60-h. p. for the fine new Arion Society Building's Edison plant; and two 60-h. p. for the Paxton House (Omaha) Edison plant.

Hall's adjustable automatic sight feed lubricators and oilers for dynamos and high-speed engines are all of the most simplified mechanism. These cups are easily adjusted without screws or wrenches. Mr. J. S. Hall, of 66 Cortlandt street, presents his improved oilers to the attention of electricians and engineers and builders of high-speed machinery after long and severe tests of their merits, and with the full confidence that the many advantages will be quickly seen and appreciated. The oiler will feed any kind of oil, either light or heavy, and work with the same reliability in stationary or in a moving position. It is easily filled without removing, and can be regulated to feed from one drop in thirty minutes to a stream in an instant, and the sight feed shows that there is a continuous lubrication. It works as well in hot as in cold weather. Its claims are economy and reliability.

The "Eureka" flat gum core packing, for steam or water, Hine & Robertson, selling agents, 12 Cortlandt street, is, I find, making its way in electrical plants. Among the users of it are the Newark, Hoboken, Louisiana (New Orleans), Syracuse and Providence electric light companies. It can be obtained in all sizes, and seems to be very serviceable and durable.

The inquiry in the McMahon-Flynn case still drags wearily along, and a few more witnesses have been heard.

No decision has yet been made on the city lighting contracts, although the matter came again before the Gas Commission on Monday. The following bids were received: The Ball Electric Light Company, 25 cents per light per night; the Brush Illuminating Company, 25 cents per light per night, or $91.50 per light per year; the United States Electric Light Company, 50 cents per light per night; the East River Electric Light Company, at $160 a year for some lights and $181 a year for others; the Harlem Lighting Company, 40 cents per light per night for some lights, and 42½ cents for others, and 70 cents for tower and Harlem Bridge lights, and the North New York Illuminating Company, at $146.40 per light per year. This delay is getting to be monotonous.

The Kookogey system of primary batteries for illuminating the interior of passenger cars was given a thorough test Monday night on a specially chartered car on the Chicago express, of the Hudson River Railroad, which left this city at 6 P. M. The spectators, including myself, were delighted when the light from twelve 16-candle, 40 volt, 1½ ampères lamps was shed upon them. The lights were distributed with excellent judgment throughout the car on either side below the ventilators. There is also one on each platform. There were 63 cells of primary batteries, 8 × 8, outside, suspended in receptacles under the body of the central part of the car. They were put up in sets of 21 each, each set in multiple arc. As the lamps varied somewhat in resistance, they had to use two sets with a resistance; and kept one set in reserve. I thought the light was strong enough with one set, but Mr. Kookogey and his assistant thought they would have superior illumination to a car ahead of us, the "Olga" with the Julien system in use; and then the "Olga," passengers all made a rush for our car. I ran through to Poughkeepsie, and the lamps had then been in use 1½ hours. I left the train there to return home, but the other members of the party went on to Albany. The report has been verified that they used the lights till early dawn this morning without a hitch of any kind. Radiators were in use over the lamps, softening the light. The *Tribune* of to-day says: "Attached to the fast Chicago express which left the Grand Central Station at 6 P. M. yesterday was a car lighted by a new electric system. The system is the invention of W. P. Kockogey, of this city, and the electricity is supplied by a primary battery placed beneath the floor of the car. Three series, each of twenty-one cells, are used, one of which will run twelve lights continuously for fourteen hours. Ten of the lamps were placed at different intervals in the interior of the coach last evening, and one at each platform. They shed a soft, brilliant, white light, which was agreeable to the eye and burned steadily and without a break as the train sped along at a rapid rate. The car in which the system was tried ran to Albany." The *World* says, "The New York Central Railroad Company is still experimenting with electric lights in cars for the purpose of selecting one of the various systems which will give the best service and do away altogether with the use of oil lamps. Last night a new patent was tried on the 6 o'clock train for Chicago. It was the Kookogey system, and was used in the last car. The superiority claimed for this device is that it supplies a direct current generated by a battery carried under the car, doing away with the storage battery. Ten lights inside the car and one on each platform were supplied by this one battery, which weighs but 780 pounds, and which will furnish sufficient electricity for 32 hours at a cost equal to the cost of gas at the rate of $4 per thousand feet. The experiment was a success, and seemed to demonstrate the practicability of the system for lighting cars."

The Mutual Electric Manufacturing Company, 292 4-6 Graham street—within three blocks of the DeKalb avenue elevated station, Brooklyn—is prepared to manufacture ammeters for testing circuits of any ampèreage, voltmeters, automatic time cut-outs for arc circuits, automatic cut-outs for charging storage batteries, automatic "circuit" cut-outs for cutting out lamps when the current is being used for charging batteries or for running motors. The company also makes a specialty of the Knowles system of arc and incandescent lighting, and has a special dynamo for charging secondaries.

The Mutual Accumulator Company, of Brooklyn, has been attracting considerable attention. I see Mr. R. Arnold, who is very prominent on the New York Produce Exchange, and in commercial circles, is its President. Mr. L. H. Arnold is the Secretary and Treasurer; Mr. E. R. Knowles, Electrician, and Mr. T. E. Otis, Vice-President. The company is to manufacture and handle Julien storage batteries, with valuable territorial rights. It is now fitting up two floors in the Tollner buildings, with special machinery for its work, the batteries being intended for lighting purposes and for use with Julien motors.

W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, May 17, 1887.

Mr. A. P. Mason, manager of the Simplex Electric Company, has started out for a few weeks' trip among the electrical people in the interests of his company.

Mr. Louis H. Mudgett, for several years attached to the Boston office of the Jarvis Engineering Company, is now traveling in the interests of that company.

Mr W. H. Wilson, a clever electrician and a good mechanic as well, has leased a workshop at No. 73 Cornhill, Boston. Mr. Wilson will manufacture to order any kind of electrical goods or electric-light supplies.

Ground was broken this week at Woonsocket, R. I., for the commencement of the electric street railway. The necessary funds have been raised, the company organized, and the enterprise is a certainty.

The Gamewell systems of fire alarm and police call are being installed in Brookline, Mass. It is predicted that both systems will be in working order by the last day of this month.

Mr. Edward L. York and a few others have incorporated a company at Kittery, Maine, to be known as the Massachusetts Uncle Sam Electric Light and Battery Company.

Another acoustic telephone company has been organized at Portland, Me. This time it is the American Pacific Acoustic Company. The capital is modestly put at $1,000,000. Mr. Geo. H. Chellis is said to be the president.

Bell Telephone stock for several days past has been hovering between 220 and 230. It is reported that the Bell people are very sanguine that the Supreme Court decision, which may possibly come this week, will be in their favor.

A report emanates from telegraphic circles here that recent contracts made by the Baltimore & Ohio Telegraph Company indicate that there is little immediate chance of any deal with Western Union while the increase of business is making both companies more independent.

At the annual meeting of the Mexican Central Telegraph and Telephone Company, on Thursday, May 12, the following directors were chosen: George W. Ballou, Charles O. Morris, John McGinty and J. D. Sargent. The treasurer's report shows a cash surplus of $1,514. The company claims to have 278 telephones in use—an increase of 33 over last year; and it is said that it is the most important of the Mexican sub-companies and the only one paying dividends. It controls, I am informed, the following States in Mexico: Queretaro, Guadajuato, Aguas Calientes, Zacatecas, and San Luis Potosi; and has exchanges in the five chief cities.

At the Massachusetts State House, on May 13, the Committee on Mercantile Affairs reported the following bill for regulating telephone rates:

Section 1. No individual, company or corporation, now or hereafter owning, controlling or operating telephone lines in this State, shall charge for the use of a telephone, except as follows: In cities having at the last census a population of 100,000 and over, a sum not exceeding $6.50 a month; in cities having at the last census a population of 50,000 and less than 100,000 a sum not exceeding $4 per month; in cities or towns having at the last census a population of 10,000 and less than 50,000, a sum not exceeding $3.50 per month; in towns having at the last census a population of less than 10,000, a sum not exceeding $3 per month.

Section 2 fixes the fine at $25 at the outside, and Section 3 provides that the act shall take effect July 1, 1887.

The Mather Electric Company's new factory at North Manchester, Conn., is so far completed that the carpenters are now at work finishing the roof.

The "bill to authorize gas companies to furnish electric light" passed the Lower House of the Massachusetts Legislature on May 11, by the close vote of 55 to 54.

The Waterbury (Conn.) Electric Light Company—using Thomson-Houston arcs and Edison incandescents—possess the entire lighting contract for the city named. The number of arc lights in use is upward of 200, the city contract alone being 135 lights. The incandescent equipment includes two Edison machines, each of 250 lights capacity. This department has just begun running.

The Hartford Heat & Power Company reports having 1,000 incandescent lights in use or contracted for. This company uses the Westinghouse alternating or converter system. One Westinghouse machine of 625 lights capacity and two Mather machines each of 325 lights capacity comprise the dynamo equipment of the plant. Mr. David Henning is the president of the company; Mr. David Myers, superintendent; Messrs. Joseph Grimes and Albert Mather are the engineers.

The Torrington, Conn., Electric Light Company started up its plant on March 15. The Westinghouse alternating system is used, with about 600 incandescent lights at present in circuit. The source of power is a turbine water-wheel of about 80 h. p. The manager is Mr. C. L. Russell, and Mr. F. B. Rooney has charge of construction and inside wiring. The company comprises some of the wealthiest and most enterprising citizens of Torrington.

The extensive changes now being made at the central station of the Edison Illuminating Company, of Brockton, are attracting considerable attention, from the magnitude and rapidity of the work being done. The reorganization of this plant was placed in the hands of Mr. J. H. Vail, General Superintendent of the Edison Company, and it has been pushed in the manner characteristic of the policy of the company named.

One of Mr. Vail's first moves was to effect a consolidation of the arc and incandescent lighting, avoiding any conflicting interests, and largely reducing the cost of running the stations.

He also has added the Sprague motor system and contracts are made for considerable power. Within the past few weeks a chimney of capacity equal to 1,000 h. p. has been erected, and is to-day the largest in that vicinity and is a very handsome structure.

The station is also being greatly enlarged in size, a second story put on, and equipment being increased, by addition of steam power and electric apparatus.

An electric light plant was installed at Meriden, Conn., about eighteen months ago by the original Fuller-Wood Company. When the American Company purchased the Fuller-Wood property it completely renovated and added new equipment to the old plant, and at present 150 arc lights are furnished. A new station is now in course of construction, and it is expected that it will be completed before the last week in this month.

The following dispatch from Great Barrington, Mass., appeared in the Boston morning papers May 11: The village is surprised and displeased because the superintendent of Mrs. Mark Hopkins' place has given notice that the town's electric lights, which are supplied from the great mansion, will be discontinued after July 1, probably because all the capacity of the plant is now wanted for the completed house. Now the village will have to go back to kerosene. The ill-feeling is increased because Agent Searls, of Kellogg Terrace, is having a high board fence built around the place for the purpose of shutting off the people's view, and preventing photographers from taking views of the place. My idea is that the village will not go back to kerosene.

The Hartford Electric Light Company has now in actual use 425 Thomson-Houston arc lights and 450 Sawyer-Man incandescent lamps (from Thomson-Houston dynamos), and has orders in hand for additional arcs and many more incandescents. The arc lights are used as follows: 125 for lighting the streets and 300 commercial. The majority of the incandescents (300) are on circuit direct from dynamos, while 75 are in multiple series, and 75 in straight series. The manager and superintendent of the company is Mr. H. H. Johnson; electrician and chief engineer, George D. Johnson.

W. I. B.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, May 14, 1887.

The Wunder & Abbott Illuminating Company, whose stations I described in my letter of three weeks ago, have sold all their plants to the Chicago Arc Light and Power Company. By this purchase, the new company have added some 300 additional lights to those already acquired by them. This does not include Wunder & Abbott's new plant, which they had almost completed, and which was intended to have a capacity of 500 lights. If the Chicago company carries out the original intention respecting this plant, it will give them over 1,500 lights to start off with.

The company's engineers are engaged in looking for a suitable site on which to erect their large central station. As soon as found, building operations will commence. The company is evidently determined to push things—and will "get there."

Col. W. W. Dudley, the well-known ex-Commissioner of Pensions, has closed a contract to build an electric street railway at Muncie, Ind.

The Van Depoele Company's 250 h. p. generator, which you illustrated in your issue of April 30, has been running for the past week in the Capital City Electric Railway's station at Montgomery, Ala. The company now has six cars running, and Mr. Dunham, the superintendent, expects to operate eighteen cars within a couple of weeks.

The bill regulating telephone charges was made the special order in the Illinois Senate last Tuesday. It was on second reading. Amendments were offered by Senators Stephenson and Bell providing for operations under the regular yearly rental and the toll systems. The object was to prevent evasions of the law by the telephone companies. The regular yearly rental is fixed at $36, while under the toll system established the charges for ordinary usage would not exceed that. It is provided that even under the toll system the charges shall not in any case exceed $6 per month, and the companies are required to file a notice with the Secretary of State showing the system under which they propose to work. The amendments were adopted, and the bill was sent to third reading.

I saw the other day a very ingenious electrical device in the shape of a heat regulator. This device, which was invented and is controlled by Mr. A. M. Butz, of Minneapolis, Minn., consists of a thermostat placed in the living rooms, and may be set at any desired degree of temperature; a spring motor which is located in

the furnace room and is arranged to open and close the check damper and drafts of the furnace; also an alarm bell that may be put up in the kitchen or servants' room. A battery and wires connect the thermostat with the motor and alarm bell. Mr. Butz claims that this invention, which he calls "the Automatic Electric Heat Regulator," will maintain a uniform temperature, effect a large saving of fuel, and will prevent an extremely hot fire, with resulting damage to the furnace. The alarm bell is for the purpose of attracting attention when the furnace needs more fuel. This apparatus has met with great success in Minneapolis, where a large number are in use. Mr. Butz's address is 15 East Washington street, Chicago, where his invention is also on exhibition.

The Western office of the Sprague Electric Railway and Motor Company are installing at the Aurora shops of the Chicago, Burlington & Quincy Railroad, a 7½ h. p. motor to operate the traveling car table, which conveys the cars while in progress of building from one shop to another.

The Bidwell Electric Railway Light and Power Company are operating an exhibition plant on the lake front.

Col. S. G. Lynch, broker, 146 La Salle street, Chicago, furnishes me the following telephone stock quotations.

Bell of Mo.	$155@$157
Central Union	50@ 51
Chicago	385@ 400
Colorado	20@ 22
Cumberland	80@ 85
Great Southern	30@ 33
Michigan	74@ 75
Rocky Mountain Bell	40@ 45
Wisconsin	105@ 107

W. A. K.

THE TELEGRAPH.

Telegraph Cables Injured.—Some of the six cables of the Baltimore & Ohio Telegraph Company which cross the Narrows from Staten Island to Long Island were injured by the anchor of an ocean steamer Wednesday morning, May 11. A large force of repairers were put on, and by evening everything was in running order. Each cable contained 36 wires connecting this city with Philadelphia and many cities of the South and West.

The Mexican Telegraph Company.—The Mexican Central Telegraph and Telephone Company held its annual meeting in this city last week. The directors chosen for the ensuing year were George W. Ballou, Charles O. Moore, John W. Weed, John McGinty and J. D. Sargent. The earnings of the Mexican Telegraph Company for the week ending May 7 were $5,419, and of the Central & South American Company the same week $9,291.

A Million Wanted for Damages.—A special dispatch of May 13, from Hartford, Conn., says: An attachment in a suit for $1,000,000 brought by Clinton J. Farrell, Receiver of the Bankers & Merchants' Telegraph Company, was served upon the local office of the Western Union to-day. The suit is for damages caused by the cutting of the Bankers & Merchants' wires in July, 1885, by the agents of the Western Union. The switch-board in the local office was attached, but was promptly receipted for. A copy of the writ was also served upon W. D. Bishop, a director of the Western Union, at his home in Bridgeport.

Mr. Edison in Florida.—"I experimented mostly on telegraphing by sea, but have not gone far enough yet to make known the progress I have made. My experiments gave me satisfaction, however, and next year I think I will have the work completed. I have experimented both by electrical and mechanical processes. It is an excellent place down there for such work. The waters are calm and not deep, with an unbroken stretch of at least twenty miles. I think the time will come when vessels at sea can talk to each other at distances of twenty miles. The talking will be done by means of dots and signs, and anybody can understand them."

THE TELEPHONE.

The Telephone in China.—The syndicate which is now about to develop the telephone in China has, it is said, a backing of $26,000,000.

The American Pacific Acoustic Company, of Portland, Me., has been incorporated with a capital stock of $1,000,000. Mr. G. H. Chellis is the president.

Is Any Case of Infection on Record ?—The danger of infection from the promiscuous use of the mouthpieces of telephones is attracting attention. It is recommended that the mouthpiece be disinfected every time after using by means of a disinfecting fluid kept at every telephone station for the purpose.—*Ex.*

Bell vs. Egan.—The American Bell Telephone Company has brought suit, in Cleveland, for infringement, against the Egan Electrical Company, which has been making the telephone of C. E. Egan and selling it. The Egan Company is backed by some of the wealthiest citizens of Columbus. They are W. Y. Miles, C. P. L. Butler, Jr., W. A. Neil, Ralph Buckley, J. F. Doyle, C. H. Weaver, Henry L. Peck, C. S. Morgan and C. E. Egan. An injunction is asked for.

The Supreme Court Decision.—A special despatch from Washington says: There is much speculation among persons interested in the telephone cases as to the time when the decision of the court in those cases will be rendered. So far as is known the court has given no intimation of an intention to decide them at the present term. The prevailing impression among lawyers seems to be that if the court has concluded to affirm the judgment of the lower court an announcement to that effect will be made before the adjournment next week, and that the opinion will be prepared at the leisure of the court during the summer vacation. If, however, the court should decide to reverse the judgments it would probably be necessary to prepare the opinion at once for the guidance of the lower tribunals, and it is regarded as doubtful whether the court has had or will have time enough to prepare an opinion as long and elaborate as that which a reversal would make necessary. In such a case therefore the decision would probably not be announced until next term.

THE ELECTRIC LIGHT.

Roanoke, Va.—The Home Electric Light Company, Mr. J. M. Gambill, president, has been incorporated.

Fitchburg & Old Colony Railroad.—The Electrical Accumulator Company are now busy fitting up storage lighting apparatus on cars of the above road.

Monmouth, Ill.—Note has already been made of the move to install a lighting plant at Monmouth. Steps are now being taken to organize a stock company to put it in.

Detroit, Mich.—The Ball Engine Company have sold to the Brush Electric Light Company, of Detroit, Mich., five of their 13x12 engines, which will go into the new station now being erected.

The Improved Light, Heat, Power and Manufacturing Company, of Saco, Me., has been incorporated, with a capital stock of $500,000. Mr. F. A. Dearborn, of Newton, Mass., is the president.

Chicago, Ill.—Progress is reported with the plant put in on the Lake front, in the way of demonstration by the Bidwell Electric and Manufacturing Company, which lights its cars from the main current.

Victoria, B. C.—The Victoria (B. C.) Electric Illuminating Company's Edison plant has been now running for three months, instead of sixty days, as stated recently, and is to be increased shortly from 400 to 1,000 lights.

Staten Island.—The experiment of lighting Maple avenue, Clifton, S. I., with the Edison municipal system, was successfully carried out last week, and Mr. Erastus Wiman is promoting the organization of a local lighting company.

Cambridge, O.—The City Council granted recently to Mr. Eugene Ingold, of Pittsburgh, a contract to light the city for three years. There was an active fight between competing companies. Mr. Ingold is now installing a plant of the American system, which he represents.

Vancouver, B. C.—An Edison plant is now being put in at Vancouver, B. C., all the machinery, which is of Canadian manfacture, being supplied by Mr. A. J. Lawson, the Edison Company's Canadian agent, who also furnishes Armington & Sims engines, tubular boilers and Worthington pumps for this station.

The Hawkeye Electric Manufacturing Company, with factory at Oskaloosa, Ia., has established offices at 64 Liberty street, Mr. E. Bymer, agent. The company sells a full line of electric lighting apparatus, and claims to have a first-class motor. Mr. Herrick is now doing construction work for the company, for the lighting up of 192 Broadway from the Liberty street offices.

Chicago Grand Opera House.—It had been the intention of Mr. John A. Hamlin, the well-known manager of the Grand Opera House, Chicago, to put in an isolated incandescent lighting plant. But in view of the immediate prospect of an extensive supply from the new Edison central station, which is going to have a capacity, it is said, of not less than 30,000 lights, he will await that opportunity.

In a Country House.—Work has begun this week on the storage plant in the country residence, at Greenwich, Conn., of Mr. E. H. Johnson, the president of the Edison Company. Two 60 cell sets will be installed by the Electrical Accumulator Company, who will be assisted by Mr. C. L. Edgar, of the Edison Company. The Edison machines will not only supply light and charge the batteries but will operate motors.

The New Pullman Train.—The magnificent new Pullman train of five palace cars, that has lately been on exhibition in various cities, is now being equipped with incandescent lamps and storage batteries by the Electrical Accumulator Company. The electric light is the only one that goes well with such taste and beauty, or that will not spoil the elaborate decorations. The train goes on the Pennsylvania road to run between New York and Chicago.

Boston & Albany Railroad.—Mr. G. W. Blodgett, the electrician of the Boston & Albany road, gives in the *Railroad Gazette* an interesting account of the successful lighting of their cars—and the two complete New York limited express trains—with the Julien storage system. Blodgett Brothers are now equipping the well-known "observation car" with this system. Mr. Blodgett says: "Electric lamps in the cars will be as common as the air brake and the Miller platform."

A Long Run at Montreal, Can.—The Edison dynamo and Armington & Sims engine supplied to the St. Lawrence Sugar Refining Company, of Montreal, four years ago, are reported by Mr. A. J. Lawson as still in perfect condition. The commutator of the dynamo has only worn ⅛ inch in diameter in that time, although run day and night from Monday morning till midnight Saturday the year round without cessation. One set of brushes only have been used in a year, and both engine and dynamo have made the long run of 42 days and nights, or 1,008 hours, without stop. Several of the lamps have given a life of 7,000 hours, and are not yet burned out.

A Philadelphia Dry Goods Store.—One of the finest dry goods stores in the country is now being fitted up by Messrs. Strawbridge & Clothier, of Philadelphia, Pa. This store is being fitted regardless of expense, and is to be palatial in its appointments. It will be entirely lighted with the Fort Wayne Jenney system of arc and incandescent lights, the motive power being five large automatic engines, made by the Ball Engine Company, of Erie, Pa. These engines were sold by their agent, Mr. H. M. Sciple, of Philadelphia.

APPLICATIONS OF POWER.

Muncie, Ind., is to have an electric street railway.

Woonsocket, R. I.—The electric railway talked of for busy Woonsocket is already in course of construction.

Long Island.—The Flushing and College Point Electric Street Railway Company has filed articles of incorporation at Albany. The capital stock is stated to be $150,000, divided into 1,500 shares of $100 each. The company will operate an electric railroad through the villages of Flushing and College Point. The length of the road will be six miles.

San Diego, Cal.—The electric railway which the Henry Company, of St. Louis, has contracted to equip, will be 20 miles long.

Asbury Park, N. J.—It is said that the electric railway for Asbury Park is to have 15 cars, each being lighted by the propelling current.

Atlanta, Ga.—An ordinance has been passed by the City Council, authorizing the Metropolitan Street Railway Company to operate its line with electric motors.

Abroad.—European purchasers of American electric motors are giving them the preference. All the leading firms are shipping abroad.—*Chicago Journal of Commerce.*

Cambridge, Mass.—An electric car is now being fitted up at the shops of the Cambridge Street Railway Company, under the supervision of Mr. A. L. Russell, the electrician, of Boston.

Newton, Kan.—Electricity or steam—probably the former—will be used on its new 3-mile road by the Newton Rapid Transit Company, recently organized with a capital of $50,000. The directorate comprises Messrs. H. L. Hart, J. H. Anderson, F. Winnie, S. Lehman and A. B. Gilbert.

An Eastern Foothold.—The Van Depoele Electric Manufacturing Company, of Chicago, has recently had to grapple with so large an extension of its Eastern electric railway business that it has been compelled to take offices in New York. It now has a handsome suite in the new Aldrich building.

Ithaca, N. Y.—Messrs. Haines Brothers are, as already noted by us, adopting the Daft electric railway system, and the Safety Electric Railway and Power Company (J. Murray Mitchell, president) are doing the work. Great interest is taken in the new road, says the *Street Railway Gazette*, by the students of the Cornell University.

Lima, O.—The work of construction on the Lima Van Depoele road is now going on, and the line, five miles in length, will very shortly be in operation. The president of the road is Mr. B. C. Faurot, and Mr. F. L. Langanen is the secretary and treasurer. Overhead conductors will be used. Pullman cars of the latest make and best style will be used, and the road will be equipped with the Johnson steel street rail.

Girard, Kan.—Dr. G. T. Carpenter, the principal mover in the street railway enterprise, having obtained accurate and reliable figures, states that a two-mile line, with equipment for electric attachments, will cost about $8,000, and the same length of line drawn by horses, $5,000; but after the former is ready for business it will cost much less to maintain. Plans will soon be perfected and laid before the public.—*Street Railway Gazette.*

Wichita, Kan.—The Princess Motor Line Company has been organized by Oscar Sherman, J. L. Mead, Graham & Jones, etc., to construct a line running south on Main, from the corner of Williams to Howard street, where it will cross the river to Wheeler avenue, west past the Catholic See; then turning north will run to the first section line, and then east to the city. The line will leave the Glendale addition to the north, the East Garfield University addition to the south, as it will also the Richardson addition. The Princess addition will be left to the north, and on this addition will probably be located a suburban depot. The cars will be operated by electricity, and the motor will be of the latest style. An ordinance has been framed and submitted to the City Council for approval.—*Street Railway Gazette.*

The Boston Refinery Road.—The Sprague Electric road at the Boston Sugar Refining Company's yards is in most successful operation. The cars are in use all day long, the loads averaging 10 tons per trip, and each round trip occupying five minutes. Horses were used previously, when each trip averaged fifteen minutes with a load of 1½ tons. The heaviest load yet hauled by the motor was 11 tons net, or, including cars, etc., 15 tons gross. In spite of the heavy coatings that the rails get of mud, sugar and molasses, forming by no means bad insulation, the rails answer very satisfactorily as "return." The Edison dynamo used for lighting runs the motor.

A Road for the Austrian Alps.—The Austrian government has granted a charter to the firm of Siemens & Halske to make a preliminary survey and a location of a railroad from Lend to Bad Gastein and Böckstein, in the Australian Alps, to be operated by electricity. The maximum grade will be 4 per cent., the entire length 15.3 English miles, and the cost is reckoned at about $353,000. From the station at Lend the road will, by a series of extensive curves, avoid the high grades until it reaches a point above the falls of the river; then it will be laid through the Klamm pass, and the bed of the river Ache, until the level of the village of Gastein is reached. This plan was adopted in preference to that of two competing firms for its cheapness and practicability. They proposed more direct lines, which would have necessitated the use of the rack rail for some short sections with steep grades which would have been unavoidable.

Appleton, Wis.—In a recent letter to the Van Depoele Company, Judge J. E. Harriman, the president of the electric street railway at Appleton, says: "Our road, as you know, commenced operating Aug. 16 last; except a few weeks to get the track all right and get the cars limbered up, we had a continuous run. The snow we found we could master, and did with the electric cars, pushing a snow plow which we made ourselves. The overhead wire, which we feared would give us the most trouble, has never bothered us, to exceed two hours twice this winter, although the telephone and telegraph wires were made useless for their business many times. We know that we have made more hours and better time all winter than we could possibly have done with animal power. We operate our road, three miles, in schedule time, with three cars regularly, and the time does not vary a minute any day at the switches or at the end of the line. We run five cars on busy days. I do not need to elaborate—we cannot find any fault with the system. The wires have not been touched since last fall and the motors are doing their work perfectly. The travelers are doing well. The dynamo I have not heard from in a long time, although a new man is running it. All of the help that we have are new at the business, yet all runs like a clock. Hundreds have been here to examine our road, and, without an exception, have been perfectly satisfied that electricity is the future power

for street railways on account of its simplicity, reliability, rapidity and neatness. You may quote our company and our citizens as for it first, last and all the time."

PERSONALS.

Gen. A. K. Stiles.—The venerable and dignified figure of Gen. Anson K. Stiles, of Chicago (of the Van Depoele Company) was conspicuous in the Astor corridor yesterday, and enjoys the distinction of being a prominent figure on the canvas of the Monitor and Merrimac Panorama. He is about 60 years old, white-haired and straight as an arrow.—*Evening Sun.*

Mr. H. C. Adams, for several years New York manager of Holmes, Booth & Haydens, has resigned his position with that company to become the purchasing agent for the American Electric Manufacturing Company. Mr. Adams assumes the duties of his position immediately, and hereafter will have the entire purchasing of all supplies for the American Company as well as general over-sight of the manufacturing business of that company. Mr. Adams' long experience in the brass and copper business makes him especially adapted to fill the position he has accepted with the American Company.

Mr. E. H. Goff.—The sketch of the life and career of Mr Goff, by Thomas Kirwan, of the Boston *Herald*, is, we notice, receiving very kind and complimentary notice from our New England exchanges, especially those in places where Mr. Goff passed his early days, before becoming an electric light potentate.

Mr. W. T. Mottram, for more than a year past electrician for the Wilmington City Electric Company, has resigned his position, and will leave this city for New Orleans to accept the superintendency of the Edison Electric Company in that city. Mr. Mottram has made many friends in this city who will be sorry to have him leave, but will rejoice in the fact that his material welfare is benefited by the change.—*Wilmington (Del.) News.*

Mr. J. M. Pendleton, the recently-elected president of the New York Electrical Society, is well known among electricians as interested in electrical applications of all kinds, and as being himself an inventor. He is a man of quite military bearing, but was in years gone by a leading merchant in the peaceful trade of wool importing. He has an office in this city. He owns considerable real estate in Boston and on Staten Island, to which he devotes a large share of attention. His residence at New Brighton, Staten Island, is a big old-fashioned mansion of the Southern type, with portico large enough for a parish church. It was built by his father. From the broad piazza and the front windows, the Statue of Liberty with its electric torch is easily seen, across the Bay, and the view of it from that point is one of the best to be had.

Mr. Erastus Wiman, so prominently connected with telegraph and lighting interests has, it is said, concluded to purchase from the inventors all the improvements upon a pulverizer which it is claimed, illustrates an entirely new principle in mechanics, the application, namely, of the natural principle developed in a cyclone. The results show that iron slag can be reduced to impalpable powder, and that other refractory substances can be treated with equal facility. A test made with a half-barrel of nails showed the iron ground into the finest powder without the aid of tooth, stamp or roller, and with nothing but air.

Mr. Geo. C. Hill, a young electrician of Birmingham, Ala., has contrived a small storage battery plant for personal application, so to speak. It includes a motor and electric light jewelry. The bulky part of the apparatus is carried in what is technically known as the "dress improver." When the lady gets tired and wants fanning all she has to do is to attach the two wires of a small electric fan she carries to her brooch, and it will revolve at a high speed with a much more cooling effect than the most vigorous fanning of a dude. The apparatus complete weighs only 19 ounces, and will furnish 8 candle-power of light for six hours at a winding. There is no liquid in it to spill, and the most emprancing dancing will not affect it.

MISCELLANEOUS NOTES.

Watch Inspection.—Every conductor, engineer, and flagman on the great Wabash Railroad system has been required to carry a standard watch of the style known as the "15 jeweled patent regulator adjusted to heat and cold," and protected by the "anti-magnetic shield." The plan is to be carried out at the least possible expense to the men, and will, it is thought, be generally adopted on other railroad systems.

BUSINESS NOTICES.

Canadian Patent For Sale, on the most liberal terms for the electric gas-lighter that is having a large sale in the United States and being liberally advertised. Address H. W. Hedge, 102 Fulton street, N. Y.

Manufacturing Carbons has been one of the most unsatisfactory branches of electric lighting. Some years ago a good deal of money was made in the business, but it is believed by those who ought to know that, without exception, all of the companies have since sunk in it, not only what money they made, but a larger part of their capital. Still the manufacture of carbons appears to have a fascination for outsiders, and there are plenty who seem to be willing to put their money into the business upon some visionary theory of there being "millions in it."

Jordan & Gottfried, 208 Canal St., N. Y., carry a complete stock of iron and brass machine and wood screws, bolts, cap and set screws, taps, dies, files, twist drills, brass and rubber in tubing, rod and sheet copper, brass, German silver, steel and iron wire, shafting, tools, etc.

Carbons.—The angry feelings of a good many electric light men were aroused when they heard of the advance in prices of carbons, but now they begin to see that this step was necessary to save the manufacturers from failure. No one could expect that carbon makers, any more than the makers of any other goods, could continue to sell their product at less than cost.

The Pond Engineering Company, of St. Louis, has just issued a new pamphlet and illustrated catalogue of improved steam and hydraulic machinery. We have already had occasion to notice this useful book, in its previous editions, and can now only re-echo our praise. It is fuller than ever of valuable hints and information, and should be in the hands of all who are operating or building electric light and power stations, as the company make a specialty of station equipment.

The slight advance in the price of carbons made by some of the companies will, the managers of these companies feel sure, result in a great deal better and more uniform carbon. A few years ago carbons sold at $100 a thousand, and at one time they commanded even a higher price. Owing, however, to the bitter competition among carbon manufacturers, prices kept tumbling until they reached a point where the less business a factory did the more money it made, or, at least, the less it lost. It could not be expected that carbon manufacturers would continue indefinitely to sell carbons below cost. Electric light superintendents have been so used, however, to buying carbons at the ruinously low prices, that they cannot understand why they should now be called upon to pay higher rates. The fact is, however, that for a first-class carbon, one that will give satisfaction both to the superintendent and his customer, the price decided upon by the manufacturers is very reasonable. If the companies by their combined efforts can make a good carbon at a price that will enable them to sell it at a lower price than is now charged, they will be very glad in the protection of their own interests to lower the prices. In the meantime superintendents can depend upon getting from us good carbons, which will be shipped in any quantity on the day the order is received.

Quotations, or any further information, can be obtained by addressing E. C. Hawks, Agent, 90 and 91 Wilshire Building, Cleveland, O.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED MAY 3, 1887.

362,053. Electric Rock Drill; C. E. Ball, Philadelphia, Pa. Assignor to C. A. Cheever, trustee, New York, N. Y. Application filed Sept. 11, 1882. An electric motor is mounted directly on the cam shaft. The cam drives the drill rod.

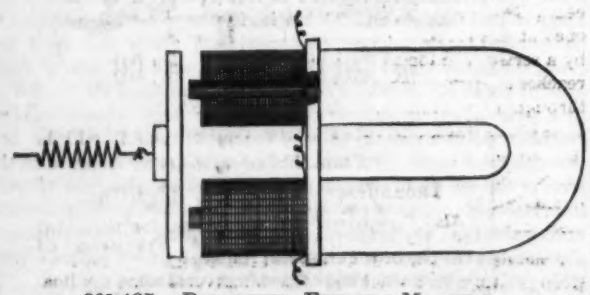
362,062. Multiple Subsidiary Ground Terminal for Lightning Rods; J. W. Cole, of Greencastle, Ind. Application filed Jan. 15, 1887. Several metallic branches are run out in all directions into the earth.

362,064. Lightning Rod; E. O. Daniels, of Springfield, Ohio. Application filed Jan. 15, 1887. This is a tubular rod in which means are provided for allowing the current to flow on both the outer and inner walls.

362,108. Connector for Electrical Appliances; C. G. Perkins, of Hartford, Conn. Application filed Dec. 18, 1886. The object of this invention is to provide means for making connection between wires running along walls and electric appliances projecting from the same.

362,115. Telephone Support; S. Rosenblatt, of New York, N. Y. Application filed March 14, 1887. This is a support for telepone receivers, provided with ball and socket joint and adapted to be secured to a wall, table or other support.

362,128. Incandescent Electric Lamp; S. F. Van Choate, of New York, N. Y. Application filed Aug. 11,



362,135. POLARIZED ELECTRO-MAGNET.

1882. The object is to so construct the lamp that the inclosing globe may be removed and replaced at pleasure for the purpose of obtaining access to the light-giving portion of the lamp, and so that the lamp will be resealed upon the simple restoration of the globe.

362,133. Electro-Therapeutic Strength-Testing Machine; E. R. Whitney, of Manchester, N. H., Assignor to H. and W. Paddock Fairbanks, of St. Johnsbury, Vt. Application filed July 30, 1886. A device for measuring muscular strength. The greater the exertion, the more current is sent to indicator, which registers accordingly.

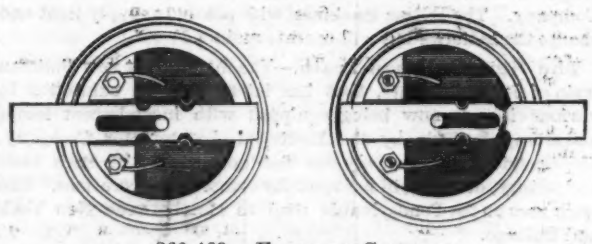
62,135. Polarized ElectroMagnet; J. C. Wilson, of Boston, Mass. Application filed Aug. 24, 1885. A permanent magnet and an inductor are in magnetic contact with each other, the inductor consisting of soft iron cores and inductive coils thereon, combined with a fixed magnetic connector joining the cores of the inductor at the point of contact or junction with the permanent magnet. See illustration.

362,192. Electrical Circuit Closer; G. E. Thaxter, of Boston, Mass. Application filed Aug. 2, 1886. The closer is in the form of a "pull." In its normal condition the terminals are insulated from each other, but a pull will cause metallic portions to come together and complete the circuit.

362,212. Electric Regulator for Heating Apparatus; R. L. Guion, of Elmira, N. Y. Application filed Nov. 20, 1886. Any kind of a thermostat is used with the proper connections and a motor to regulate dampers, etc. See illustration.

362,216. Electric Signaling Apparatus; S. Iliyne-Berlme, of Paris, France, Assignor to Leo De Colanga, of New York, N. Y. Application filed Nov. 16, 1886. This is a simple construction of bell, combined with a dry battery, the whole being located in a single box. See illustration.

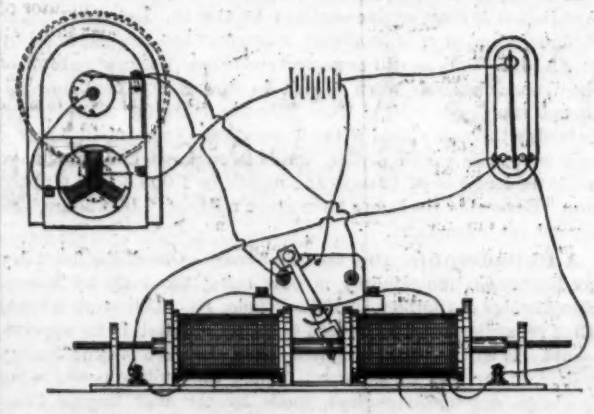
362,217. Multiple Switch-Board; M. G. Kellogg, of Hyde Park, Ill. Application filed Oct. 28, 1886. A nove



362,469. ELECTRIC SWITCH.

jack and switch-board designed to facilitate the work of the switch-board operator.

362,257. Process of Depositing Iridium and Product of the same; W. L. Dudley, Covington, Ky., Assignor to the American Iridium Company, of Cincinnati, O. Application filed Feb. 1, 1883. This process consists in preparing an acidified solution of a salt of iridium, then depositing the metal by the aid of a battery with an anode of phosphide of iridium



362,212. ELECTRIC REGULATOR FOR HEATING APPARATUS.

and a suitable cathode for electroplating. See page 240, this issue.

362,268. Machine for Turning Insulator Pins; L. D Frost, Minneapolis, Minn. Application filed Oct. 28, 1886. An ordinary lathe carrying a pattern for guiding the tool to turn out insulator pins.

362,280. Compensating Mechanism for Regulating Electric Light Carbons; J. A. Lakin, of Westfield, Mass. Application filed Jan. 17, 1887. Improved means for counterbalancing the movable carbon rod and its attached carbon.

362,312. Electric Arc Lamp; H. Pieper Fils, of Liége, Belgium. Application filed April 14, 1886. Devices for establishing and regulating the arc.

362,322. Electric Motor; R. J. Sheehy, of New York, N. Y. Application filed Dec. 27, 1886. General efficiency is the object of this invention.

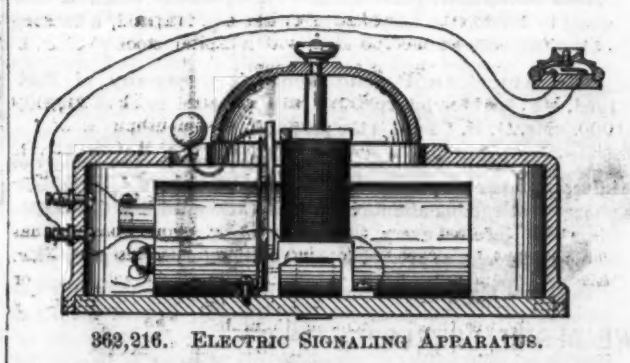
362,323. Electrical Railway; S. H. Short and J. W. Nesmith, of Denver, Colo. Application filed Aug. 9, 1886. This appartus is a bridging device between the ends of sections of an electric railway.

362,376. Electric Cable Clip; C. C. Gould and W. Smith, of Batavia, Assignor of one-fourth to Philip W. Scribner, of Tonawanda, N. Y. Application filed Oct. 21, 1886. An ordinary snap hook is adapted to be conveniently secured to a clip which grasps the cable. The snap hook fastens over the supporting wire.

362,399. Support for Electric Lights; A. G. Schlotterbeck, Portland, Maine. Application filed Oct. 28, 1886. An ordinary mast-arm provided with novel means for raising and lowering.

362,400. Railway Signal; P. J. Wicks, of Greenpoint, N. Y. Application filed Oct. 11, 1886. The road is divided into sections, and the object of the invention is to provide means whereby a train is automatically signaled when there is another train on the same section. The invention relates to electric railways.

362,451. Electric Current Indicator; P. Lange, of New York, N. Y., Assignor to G. Westinghouse, Jr., of Pittsburgh,



362,216. ELECTRIC SIGNALING APPARATUS.

Pa. Application filed Aug. 17, 1886. An electrical indicator consisting of two opposing coils, an armature acted upon thereby, two branch circuits including the coils, respectively, a carbon resistance in one circuit, and a metallic resistance in the other.

362,469. Electric Switch; A. Swan, of Newcastle-upon-Tyne, County of Northumberland, England, Assignor to the Vitrite and Luminoid Company, of New York, N. Y. Application filed June 3, 1886. Fewest number of parts, simplicity of action, ease of manipulation and ready renewal of parts are the objects sought. See illustration.

362,477. Electric Police Call Alarm Box; J. J. Coughlin, of Boston, Mass., Assignor of three-fourths to D. J. Hern and J. M. Prendergast, both of same place, and S. Oakman, of Melrose, Mass. Application filed Dec. 23, 1886. It is the design to so construct the box that a call key may be intrusted to a citizen, it not being a key that will open the box, and to so arrange the box that an officer is at once notified to call at the box at which the call-key has been used.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patent issued since 1866—can be had from this office for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, New York.